

LIBRARY R-
OF THE
Theological Seminary.
PRINCETON, N. J.

PER AS 472 .A84 v.14:2

Journal of the Asiatic
Society of Bengal



Digitized by the Internet Archive
in 2016

JOURNAL
OF THE
ASIATIC SOCIETY.

A THIRTEENTH MEMOIR *on the Law of Storms in the Indian and China Seas ; being the CHARLES HEDDLE's Hurricane in the Southern Indian Ocean, 22d to 27th February, 1845. By HENRY PIDDINGTON. With two plates.*

In my Eleventh Memoir (Journal Asiatic Society, Vol. XIV. p. 10,) I briefly announced the highly curious and beautiful *experiment*, for such in truth it is, which the Brig "Charles Heddle," Captain Finck, had been performing for us, and for the details of which the scientific world are most deeply indebted to him and to Captain Royer, Master Attendant at the Mauritius ; and I have thought them of importance enough to form the subject of a separate Memoir, inasmuch as they will be found, for the Southern Hemisphere at least, to demonstrate beyond the possibility of a cavil, the fact that the great hurricanes *are* great progressive whirlwinds ; the courses of the "Charles Heddle" during five successive days, admitting of no other explanation ; and distinctly contradicting the notion upheld by Mr. Espy, and other American philosophers, that these storms are composed of numerous winds blowing directly inwards to a common centre, while that centre is moving onwards.

Another fact also demonstrated by this log, and one scarcely less important, is that of the tremendous "Storm Wave," to which I have so

frequently drawn attention,* for there can be no manner of doubt that the "Charles Heddle" experienced a most extraordinary storm wave of four miles per hour during the storm, and this for five days successively. I refer to the summary and remarks for the details of this, and will only now observe, that this paper is arranged, like the preceding ones; giving first all the data; then the deductions from which the track of the storm, and other phenomena are laid down; and finally, such remarks as may occur. Amongst these last not the least interesting to the meteorologist as well as to the seaman will be the curious result shewn by the analysis of the winds for the five days, shewing them to have been *involutés* of a spiral curve!

Log of the Brig CHARLES HEDDLE, Captain FINCK, from the Mauritius bound to Muscat, Nautical time, from Captain ROYER, Master Attendant, Port Louis.

In forwarding this very remarkable log to me, Captain Royer, as I have elsewhere stated, observes that he thought it so singular, that he had taken the trouble to copy it with his own hand. In reply to farther enquiries from me, he states, that Captain Finck is an able and highly respectable seaman, and that his vessel, the *Charles Heddle*, was originally a slaver, and usually employed in the cattle trade between Madagascar and Mauritius, which requires always the fastest sailers. This accounts for her extraordinary success in scudding, which perhaps few vessels could have persisted in so long without imminent risk.

I have translated her log most carefully from the French, a language with which I am perfectly familiar, and I print it at length, that the whole document may be fully before the scientific public.

* See 8th Memoir, Journal Asiatic Society, Vol. XII.

Log of the Brig CHARLES HEDDLE, of Mauritius, Capt. FINCK. Copied by Capt. ROYER, Master Attendant at that Port, and translated by HENRY PIDDINGTON. Nautical Time.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Friday 21st to Saturday 22d Feb. 1845.
1	5	4	NEbN.	ESE.			Horizon very low (<i>tres rapproché</i> ,) thick weather all round. Heavy sea, smart breeze, under the large sails, pumped every two hours. Sea and wind gradually increasing, vessel labouring greatly, weather squally, and threatening all round, the squalls very heavy. At 9h. 30' p.m. the main yard went in two in the slings, clued up and furled main top-sail, un-bent main-sail, and secured the pieces of the main yard on the booms. In jib, and mizen; scudding under the fore sail, fore top-sail, and fore top mast stay-sail, to wait for day light; heavy squalls and sea. Down main topsail yard, and struck top gallant mast. Noon, in close reef fore top-sail. The gale begins to make itself be felt; scudding under fore-sail, and fore top-sail. Latitude by account 16° 42' S. Longitude account 57° 45' E.
2	5	4		Variable to SE.			
3	5	4					
4	5	4					
5	6						
6	6						
7	7						
8	7	4					
9	7						
10	7						
11	6						
12	6						
1	6	4	North.	SE.			
2	6	4		SSE.			
3	6	4					
4	6	4					
5	6						
6	6						
7	7						
8	8						
9	8						
10	8						
11	8						
12	8						

Brig CHARLES HEDDLE, Saturday 22d to Sunday 23d February 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	*13	..	WNW.	ESE.			Very bad weather; frightful sea; blowing very hard with incessant rain; vessel taking in seas over the quarter while scudding under the fore-sail, and close reefed fore top-sail. Pumped every hour, vessel labouring greatly from the seas which swept over us. At 2 p. m. perceiving that the head rope of the fore-sail had given way, sent two hands to cut away the earings, and let it come on deck, saved the sail. The fore top mast stay-sail balyards having given way hoisted the sail by a tackle. Gale at its height, scudding right before the wind, as it continually veered round the compass; pumps, attended to; vessel labouring excessively. It being impossible to clue up the fore top-sail without risking severe damage, we resolved to run our chance of what might happen. N.B. No position is given on this day.—H. P.
2	13	..	NW.	SE.			
3	12	..	NNW.	SSE.			
4	11	..	North.	South.			
5	11						
6	11						
7	12						
8	12	..	NNE.				
9	12						
10	12	..	NE.				
11	12						
12	12						
1	12						
2	12	..	E.N.E.				
3	12	..	East.				
4	12						
5	12						
6	12						
7	12	..	ESE.				
8	12						
9	12						
10	12	..	SE.				
11	12	..	SSE.				
12	12	..	South.	North.			
			SW.	NE.			
				ENE.			
				East.			
				ESE.	†		

* About is marked in the log.

† These last winds, and courses are so marked in the log, I presume they mean to designate the changes between Noon, and 1 a. m. on the next day, as a memorandum of the gradual veering.

Brig CHARLES HEDDLE, Sunday 23d to Monday 24th February, 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	12	..	SW.	NE.	..	15	Weather always the same with a frightful sea. Shipping from time to time very heavy seas. One filled the whole deck fore and aft with two feet of water; the larboard waist board carried away, much water going down the hatchways and cabin scuttle, though all secured by tarpaulins. 4 P. M. fore top-sail blew away, scudding under bare poles, the new fore top-mast stay-sail giving way, saved it; two men at the helm, vessel labouring greatly, storm always at the same beight, winds veering round the compass from hour to hour, and even in half an hour.*
2	12	..	WSW.	ENE.			
3	12						
4	12						
5	12						
6	12	..	West.	East.			
7	12						
8	12						
9	12	..	WNW.	ESE.			
10	10	..	NW.	SE.			
11	10	..	NNW.	SSE.			
12	10						
1	10						Brought all the crew aft into the cabin to be at hand, closed up the fore-scuttle. N.B. No position given on this day.—H. P.
2	10						
3	11	..	North.	South.			
4	11						
5	11						
6	11	..	NNE.	SSW.			
7	11	..	NE.	SW.			
8	11	..	ENE.	WSW.			
9	11						
10	11						
11	11	..	East.	West.			
12	11						

Brig CHARLES HEDDLE, Monday 24th to Tuesday 25th February, 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	11	..	ESE.	WNW.	..	13	The gale always at the same degree of strength, but the squalls a little heavier, pumps always in band, vessel making water. All the cabins below wet, the provisions in the great cabin also wet, the vessel making water through every seam in the deck without exception, baled the water out of the cabin by buckets. Shipped several seas which went over all. At two in the morning the vessel broached to, the water two feet deep on the deck. We remained in this dangerous position for about ten minutes, when she righted. We broached to again several times from the speed of the vessel; cleared the scuppers. At 10 shipped a sea in the fore rigging which carried away jib and flying jib booms. Cut away the wreck to clear the bowsprit. Latitude by a doubtful observation, 16° 18' S. Longitude Chronometer, .. 53° 2' 30"
2	12						
3	12						
4	12	..	SE.	NW.			
5	12						
6	11						
7	11						
8	11	..	SSE.	NNW.			
9	11	..	South.	North.			
10	11						
11	11						
12	11						
1	11	..	SSW.	NNE.			The gale always at the same degree of strength, but the squalls a little heavier, pumps always in band, vessel making water. All the cabins below wet, the provisions in the great cabin also wet, the vessel making water through every seam in the deck without exception, baled the water out of the cabin by buckets. Shipped several seas which went over all. At two in the morning the vessel broached to, the water two feet deep on the deck. We remained in this dangerous position for about ten minutes, when she righted. We broached to again several times from the speed of the vessel; cleared the scuppers. At 10 shipped a sea in the fore rigging which carried away jib and flying jib booms. Cut away the wreck to clear the bowsprit. Latitude by a doubtful observation, 16° 18' S. Longitude Chronometer, .. 53° 2' 30"
2	11	..	SW.	NE.			
3	11	..	WSW.	ENE.			
4	11						
5	11						
6	11	..	West.	East.			
7	11	..	WNW.	ESE.			
8	11						
9	11	..	NW.	SE.			
10	11						
11	11	..	NNW.	SSE.			
12	11						

* The expression is "*faisant le tour du compas d'heure en heure et meme une demi heure*," of which the literal translation would be, "going round the compass from hour to hour and even in half an hour." What is meant is evidently (by the log) that the wind was going round the compass and changing every hour or every half hour.

† The words are "*par la vitesse du bâtiment*." No doubt the difficulty of steering her is here implied.—H. P.

Brig CHARLES HEDDLE, Tuesday 25th to Wednesday 26th February 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	11	..	North.	South.	..	20	The gale always at the same strength without the least intermission, heavy sea and rain. The tiller ropes gave way, changed them, the bolts also of the tiller having given way, drove in preventer ones. P. S. Every hour. The trusses of the fore-yard gave way, replaced them, scudding under bare poles. The sea frightful, vessel making much water through the deck. Crew worn out with fatigue. The sun appeared indistinctly at noon whereby we obtained an indifferent latitude and longitude. Latitude by indifferent observation, 18° 02' S. Longitude ditto ditto, .. 51° 2' 30" E.
2	11	..	NNE.	SSW.			
3	11						
4	10	..	NE.	SW.			
5	10	..	ENE.	WSW.			
6	10	..	East.	West.			
7	10	..	ESE.	WNW.			
8	10						
9	10	..	SE	NW.			
10	10	..	SSE.	NNW.			
11	10	..	South.	North.			
12	10	..	SSW.	NNE.			
1	10	..	SW.	NE.			The horizon always obscure though sometimes clearing a little, but the squalls and sea always heavy, pumped every hour. Two men at the helm. Always under bare poles. At 10 P. M. clearing up a little, and we saw some stars, but the sea and wind always heavy. Bent fore top-mast stay-sail, and fore and aft mainsail with two reels in it. Bent another fore top-mast stay-sail on the fore stay to balance the vessel's sails.* Scudding always according to the veering of the wind. Seeing that we had sustained much damage, and that we were nearer to the Mauritius than to any other place, the Captain resolved to return there, not considering the vessel in a state to continue her voyage. Latitude observation, 20° 12' S. Longitude chronometer, 52° 24' E.
2	11	..	WSW.	ENE.			
3	10	..	West.	East.			
4	10	..	WNW.	ESE.			
5	10	..	NW.	SE.			
6	10	..	NNW.	SSE.			
7	10	..	North.	South.			
8	10	..	NNE.	SSW.			
9	10	..	NE.	SW.			
10	10	..	ENE.	WSW.			
11	10	..	East.	West.			
12	0	..	ESE.	WNW.			

Brig CHARLES HEDDLE, from Wednesday 26th to Thursday 27th Feb. 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	10	..	SE.	NW.			The horizon always obscure though sometimes clearing a little, but the squalls and sea always heavy, pumped every hour. Two men at the helm. Always under bare poles. At 10 P. M. clearing up a little, and we saw some stars, but the sea and wind always heavy. Bent fore top-mast stay-sail, and fore and aft mainsail with two reels in it. Bent another fore top-mast stay-sail on the fore stay to balance the vessel's sails.* Scudding always according to the veering of the wind. Seeing that we had sustained much damage, and that we were nearer to the Mauritius than to any other place, the Captain resolved to return there, not considering the vessel in a state to continue her voyage. Latitude observation, 20° 12' S. Longitude chronometer, 52° 24' E.
2	10	..	SSE.	NNW.			
3	9						
4	9						
5	9	..	South.	North.			
6	9	..	SSW.	NNE.			
7	10	..	WSW.	ENE.			
8	10	..	West.	East.			
9	10	..	NW.	SE.			
10	10	..	NNW.	SSE.			
11	10	..	North.	South.			
12	10	..	NNE.	SSW.			
1	10	..	NE.	SW.			The horizon always obscure though sometimes clearing a little, but the squalls and sea always heavy, pumped every hour. Two men at the helm. Always under bare poles. At 10 P. M. clearing up a little, and we saw some stars, but the sea and wind always heavy. Bent fore top-mast stay-sail, and fore and aft mainsail with two reels in it. Bent another fore top-mast stay-sail on the fore stay to balance the vessel's sails.* Scudding always according to the veering of the wind. Seeing that we had sustained much damage, and that we were nearer to the Mauritius than to any other place, the Captain resolved to return there, not considering the vessel in a state to continue her voyage. Latitude observation, 20° 12' S. Longitude chronometer, 52° 24' E.
2	10	..	ENE.	WSW.			
3	10	..	East.	West.			
4	10	..	ESE.	WNW.			
5	10	..	SE.	NW.			
6	10	..	SSE.	NNW.			
7	10	..	South.	North.			
8	10	..	SSW.	NNE.			
9	10	..	SW.	NE.			
10	10	..	WSW.	ENE.			
11	10	..	West.	East.			
12	10						

* i. e. When sail should be made, having lost the jib boom.

Brig CHARLES HEDDLE, Thursday 27th Feb. to Friday 28th Feb. 1845.

H.	K.	F.	Courses.	Winds.	Lee way	Var.	Remarks.
1	7	..	SE.	ENE.	..	..	The weather becoming fine, bent the fore-sail, and spare fore top-sail, took the main top-sail yard for a main yard, and let the reefs out of the fore and aft main-sail.
2	7	..	SSE.	Variable			
3	7	..	ESE.	to NE.			
4	7						
5	7						Cloudy still, and lightning in all quarters.
6	6	4					
7	6	4					Fine, and sea smooth with a pleasant breeze.
8	6	4					
9	6						Latitude observation, .. 20° 19' S.
10	6						
11	6						Longitude chronometer, 54° 29' 28"
12	6						
1	6						
2	6						
3	6						
4	6						
5	6						
6	6						
7	6						
8	6						
9	6						
10	6						
11	6						
12	6						

I shall notice this log separately, but at present, I proceed to print the remaining documents, so as first to adduce from them the general track of the storm, and then take up the peculiar investigations which this log gives rise to.

Abridged Log of the Ship APPOLLINE, Captain THOMAS, from the Mauritius, bound to Calcutta. Civil time.

The Appolline left the Mauritius on the 19th February 1845, with light N. Easterly winds to midnight of that day.

20th February. Winds ENE., East, and variable; at 11 A. M. cloudy suspicious weather, at Noon heavy squall and rain, latitude by account 18° 50', Round Island having borne at 6 A. M. SEbS.* since when the ship had made 23' NNE. hence the longitude about 57° 50' East. P. M. to midnight squally, moderating and freshening again, wind from NEbE. and East, ship standing from noon to midnight to the NEbN. and NNE.

21st February. A. M. wind ESE. fresh breeze and cloudy, vessel standing to the NEbN. 68' to latitude 16° 52' S. longitude 58° 10' East by

* Distance not given, or I have omitted it.

account. P. M. Barometer falling, making preparation for bad weather. At midnight brisk gales and cloudy, ship standing to the NE. wind SEbE.

22nd February. A. M. wind SEbE.; by noon blowing a complete hurricane in the squalls. 4 A. M. hove to. P. M. wind marked EbS. weather the same and a cross sea; at 8, Barometer still falling.

23rd February. The same; heavy gale and rain; blowing a complete hurricane during the squalls. At 8 A. M. Barometer 28.5, wind marked ESE. to noon, and P. M. SEbE. To midnight, the weather the same.

24th February. P. M. wind marked East; at 8 A. M. blowing a complete hurricane with much rain. Bar. 28° 5' ship under bare poles, head to the Northward. P. M. the same. Wind EbN. and at 3, NEbE. At 2 P. M. wore ship to the SE. the weather the same.

25th February. At 4 A. M. more moderate, Barometer rose 0.2. At 8 A. M. made a little sail. Noon latitude account 16° 53', longitude 55° 31' E.* and by midnight the weather was moderate.

Abridged Log of the Ship JOHN ADAM, Captain MANSFIELD, from Mauritius to Calcutta, reduced to Civil time.

The *John Adam* left the Mauritius in company with the *Sophia*, and at noon, 20th February 1845, was in latitude 14° 36' S. longitude 59° 38' E. with a fine SE. trade. P. M. the same; midnight calm.

20th to 21st February. A. M. wind ESE., East, and at noon NNE. A. M. squally, no Obs. latitude account about 12° 30' longitude 59° 30' E.

P. M. increasing wind Northerly; vessel standing to the Eastward, with a high confused sea. 9 P. M. wind NW. course NE½E. 4 P. M. Bar. 29.50, made preparation for bad weather. 10 P. M. to midnight hard gales and constant rain. Wind NW. from 9. P. M.

22nd February. A. M. moderating, NW. wind, and vessel making sail accordingly. Noon, no observation, latitude by account about 11° 30'; longitude account 61° 10' E. Barometer 29.50, thermometer 83° 10' squally and unsettled, wind NW. P. M. to midnight wind NNW. the same weather.

* Perhaps by Chronometer, worked by the latitude by account.

23rd February. To noon wind NNW. and weather becoming settled, latitude $16^{\circ} 26'$ S. longitude $62^{\circ} 44'$ East. Barometer 29.75; thermometer $80^{\circ} 40'$.

Abridged Log of the Ship SOPHIA, Captain SAXON, from Mauritius to Calcutta, reduced to Civil time.

The Sophia left Mauritius on the 16th February.—

19th February.—At noon in latitude $16^{\circ} 4'$ S., longitude $58^{\circ} 44'$ E., Bar. 29.65. Thermometer 84° , and fine weather, with three to five knot breezes, from East to ESE. P. M., decreasing breeze and cloudy to midnight.

20th February.—A. M. winds variable SE. to noon, with squalls and heavy rain. 8 A. M. dark, squally, threatening appearance. Noon latitude observation $14^{\circ} 40'$ S. longitude $59^{\circ} 13'$ E. Barometer 29.88. Thermometer 62° . P. M. wind Easterly, variable, and NE. Towards 9 P. M. Northerly, and weather very threatening, making preparations for bad weather, at 10-30. P. M. sudden shift to the East.

21st February.—A. M. winds to noon South, SE. East and NE. Noon, heavy squalls and thick rain. Bar. falling, and all preparations for bad weather. Latitude account $12^{\circ} 51'$ S. longitude $59^{\circ} 38'$. Barometer 29.60. Thermometer 81° . 1 P. M. tremendous heavy squalls, wind N. Westerly, every appearance of a hurricane. 7 P. M. Barometer 29.30. At 10 P. M. blowing a fresh gale, ship standing to the NE. 7 knots per hour* with wind at NW. to midnight.

22d February—Midnight more moderate, and Barometer rising. Daylight out all reefs, wind North, latitude noon by account $11^{\circ} 21'$ S. longitude $61^{\circ} 00'$. Barometer, 29.79. Thermometer 81° . Weather squally. P. M. weather still thick, but by midnight clear.

Abridged Extract from the Log of the Ship RANGER, Capt. STEPNEY, from the Mauritius bound to Madras, reduced to Civil time.

At Noon 19th February, 1845, the Ranger was in latitude $13^{\circ} 34'$ S., longitude $60^{\circ} 20'$, light winds N. calms with a heavy appearance to the NE. and hazy horizon. Midnight sea smooth, cloudy and squally.

* The right course in the Southern Hemisphere, for she was on the NE. quadrant of the Storm.—H. P.

20th February.—Noon latitude $12^{\circ} 56'$ S., longitude $60^{\circ} 53'$ E. light variable South and SE. airs, hazy sultry weather, and *uncommon black squally appearance to the Northward*. P. M. wind veered to the Northward, remaining variable and squally to midnight, and between North and NbE. with calms and squalls and thick dark weather.

21st February.—To noon increasing breeze NbE. latitude observation $12^{\circ} 31'$ S., longitude $62^{\circ} 00'$ E.

Note, for the last two days a current to the West of about 1 mile per hour.

P. M. Fresh gale increasing to midnight, from North at noon, at 5 P. M. NbE. to NbW. and at 12 North again. Midnight increasing gale and squalls.

22nd February.—A. M. to noon fresh gale and hard squalls, the wind *hot and sultry*. At noon, latitude $12^{\circ} 0'$ S., longitude $64^{\circ} 3'$ E. Var. 5° W. course by observation is EbN. $\frac{1}{4}$ N, $127'$. P. M. to midnight fair.

23d February.—Noon light and fine weather, latitude $11^{\circ} 26'$ S. longitude $66^{\circ} 18'$ E.

Abridged Log of the Brig ARPEUTEUR, Captain J. STILLAMAN. Forwarded by Captain ROYER. Reduced to civil time.

The *Arpenteur*, with a cargo of bullocks, (from Madagascar?) hove to at 8 A. M. and at Noon 25th February, it was blowing a hurricane from SE.; she was then in latitude $18^{\circ} 50'$ S., longitude by chronometer $53^{\circ} 40'$ E. The main topsail blew from the yard, and she was thus under bare poles. The run for the previous twenty-four hours (nautical) is not marked, but the wind which had been gradually increasing from noon 24th, from ESE. at 10 P. M. is marked SE. to noon 25th. P. M. The same winds and weather to midnight.

26th February, A. M.—Wind SSE.; most of the sails blown from the yards, vessel lying to on the larboard tack. At 2-20 P. M. calm, with a heavy sea breaking fore and aft over the Brig. At 3 P. M. the wind came from the NW. and blew with the same force; the squalls heavier till midnight.

27th February, A. M. From 8 P. M. on the preceding day to noon on this day, the wind is marked as blowing all round the compass. At 3 A. M. more moderate; at daylight clear weather, made sail; and at noon, fine. Latitude by observation $19^{\circ} 11'$ S. Longitude by chronometer $51^{\circ} 14' 45''$ E.

Abridged extract from the Log of the Barque COMMERCE DE BORDEAUX, from Bourbon to Pondicherry. Civil time. Forwarded by Captain ROYER.

We have fortunately for this vessel's Log a newspaper notice, as follows :

"French bark *Commerce de Bordeaux** from Bourbon, the 28th February, bound to Pondicherry, experienced on the 23rd in latitude $14^{\circ} 37'$ S., and longitude $54^{\circ} 44'$ E., a hurricane which lasted three days, commencing at SE. and round the compass; lost mizen mast, and main topmast, mainyard, sails and boats."

This gives us the spot where the storm commenced. The vessel lost sight of the Maupertuis at noon 21st, and stood to the N. Eastward with the SE. trade.

22nd February, A. M.—Standing to the N. Eastward. Noon, freshening. P. M. squally weather; wind increasing from SSE.; at 4 P. M. close reefed, and hove to.

23rd February, 1 A. M.—Blowing a gale from SSE.; veering to South at 5 A. M.; and SE. at 8. At 9 A. M. calm; ship not steering. Soon after noon, wind NE. increasing fast; vessel scuds to the SW. 9' per hour. 4 P. M. hurricane. Barometer two lines below "*tempête*."† heavy sea; at 5 "wind is furious." The wind is now described between 5 and 7 P. M. as making the circuit of the compass several times!

At 7 P. M. blowing harder; the fore topmast staysail split, and the vessel hroached to, and lay upon her beam ends till $9\frac{1}{2}$ P. M. when the mizen mast being cut away, and the main topmast going, she bore up; main yard arm is carried away and launch stove. No winds marked from 4 P. M. to 9 A. M.; hurricane at full, and sails blowing from the yards.

* My copy says, *Courier*. It may be my own mistake or that of the paper, but there is no doubt that this is the vessel, as the damage sustained is the same.

† I do not know what this is; I presume like our own "stormy."

24th February, A. M.—Ship buried in the sea; hurricane as before. At daylight trying to collect the wrecks; the wind continually veering all round the compass, but from 9 to Noon wind is marked ESE., and course WNW. seven miles per hour. P. M. wind marked variable, and going all round the compass; vessel going seven knots. 5 P. M. to 8, the same wind marked as going round, and vessel steering different courses, but weather moderating a little from 9 to 12; the wind always going round the compass.

25th February. Wind at 1 A. M. ENE.* Vessel's course as SSW. six knots. At 10 A. M. moderating a little: 1 P. M. the same, but still scudding under bare poles to the WSW., and SW. at 10 to midnight.

26th February, A. M.—Scudding under bare poles to the SW., but only four and five knots marked; wind moderating. 9 P. M. the same, but finer weather.

27th February, A. M.—The weather gradually moderating till noon, when it was fine; with the wind at NNE., and NE. from midnight.

From the "Cernéen" a Mauritius Newspaper, I have extracted the following notice.

"The bark *Marie Laure*, experienced on the 24th and 25th ultimo, a heavy gale of wind from the SE. Latitude $18^{\circ} 20'$ S. and longitude $53^{\circ} 30'$ E., in which she lost sails and seven bullocks."

I have also had forwarded to me the Log of the ship *Faize Rubahny*, from Calcutta bound to Mauritius, but it unfortunately contains no longitudes, and from the weather and latitudes, I judge her to have been too far to the Eastward to have felt any part of this storm.

I now give a tabular view of the wind and weather from the 21st to 23rd February, as in the former memoirs.

* No doubt a clerical error, and NNE. is meant, for at 1 P. M. ENE. wind and WSW. courses are again marked.

Tabular view of the Winds and Weather, 21st to 23rd February 1845, in the Southern Indian Ocean. Civil time.

Date.	Name of Place or Ship.	Lat. S.	Long. E.	Winds and Weather.	Barometer.	Simp.	Ther.	Remarks.
NOON 21st Feb.	Ranger, ..	12 31	62 00	Fresh gale, increasing to mid- night from Northward, ..	..	..	..	Current to the West.
	Sophia, ..	12 51	59 38	N Westerly 8 p.m. Tremendous heavy squalls,	29.60	..	81	Every appearance of a hurricane, 10 p.m. a fresh gale, ship stand- ing to the N.E. Barometer on the 20th was 29.88.
	John Adam, ..	12 30	59 30	Squally Noon, wind NNE P.M. increasing from the Northward, 9 P.M. NW.	..	..	..	Midnight hard gale and rain, wind NW. from 9 p.m.
	Appolline, ..	16 52	58 10	Fresh breeze and Cloudy ESE.	Falling.	..	..	Midnight brisk gales SE & E. and cloudy, Barometer falling. Ship standing to the N.E.
	Charles Heddle, ..	19 14½	57 48	Thick weather blowing fresh ESE. to SE. heavy sea,	..	..	..	Midnight wind SE. running to the North; latitude then 17° 53', longitude 57° 47'.
NOON 22d Feb.	Ranger, ..	12 0	64 3	Fresh North breezes, ....	..	..	..	Midnight fair.
	Sophia, ..	11 21	61 0	Wind North squally, ...	29.79	..	..	By midnight clear.
	John Adam, ..	11 30	60 59	Wind NW. squally and un- settled,	29.50	..	83 1	Note, position uncertain.
	Appolline, ..	..	..	Hurricane at EhS.	Falling.	..	..	No position given.
	Charles Heddle, ..	16 42	57 45	Hurricane about ESE. ....	..	..	..	Wind not marked at noon, but nearly this

Date.	Name of Place or Ship.	Lat. S.	Long. E.	Winds and Weather.	Barometer.	Simp.	Ther.	Remarks.
NOON 23d Feb.	Ranger, ..	0 11 26	0 66 18	Light breezes and fine weather, ....	..	..	0 1	
	John Adam, ..	10 26	62 44	NNW. and settling,	29.75	.. ..	80 4	
	Appolline, ..	.. ..	.. ..	A. M. ESE. and P. M. SEbE. heavy gale and rain, ..	28.5. 8 A. M.	.. ..	.. ..	Blowing a complete hurricane in the squalls.
	Charles Heddle, ..	.. ..	.. ..	Hurricane all round the compass, ....	.. ..	.. ..	.. ..	Scudding for the whole 24h.
	Commerce de Bordeaux, ..	14 37	54 44	Hurricane commenced here, ..	.. ..	.. ..	.. ..	See Newspaper notice.

Note. From this day we have only the logs of the *Charles Heddle* and *Appolline*, and on the 25th that of the *Arpenteur*, which are so easily collated that it is not worth while putting them in a tabular form.

SUMMARY.

The following are the considerations from which the track laid down in the Chart No. 1, has been deduced.

Taking the storm to have originated and come from the Eastward, as we have reason to believe they all do, the most Easterly log we have, which is also the first in point of time, is that of the *Ranger*, which vessel seems, on the 19th and 20th February, to have passed to the Southward of the storm (or of a storm) in between latitudes 13° and $12'$ S., and on the 21st and 22d February, perhaps to have skirted its Eastern edge in longitude 62° to 64° East. On the 21st we have the *Sophia* apparently running up and passing close to the NE. border of this storm, having had the weather fine on the 19th, and threatening on the 20th, in latitude $14^{\circ} 40'$ longitude $59^{\circ} 13'$, with her Barometer at 29.88. The *John Adam*, in company with her, also with the wind at NW. from 9 p. m. of the 21st and like her standing fast to the NE., and thus out of the storm circle.

To the South we have the *Appolline* and *Charles Heddle* at midnight 21st to 22nd

The *Appolline* with weather announcing an impending gale in about latitude $16^{\circ} 20'$ the wind being at SEbE. and the vessel standing to the NE. while the *Charles Heddle* had at this time, in latitude about $17^{\circ} 53'$ longitude $57^{\circ} 47'$ the wind so heavy at SE. that she was already scudding.

The distance however, is so great between the vessels to the North and those to the South,—for taking the *Sophia* and *John Adam* as close together, and the mean distance between the *Appolline* and *Charles Heddle's* positions as an opposite point, it will be upwards of six degrees—that we cannot allow them all to have shared in the same storm, particularly as the *Appolline*, though farther North, had not the winds, it appears, so strong as the *Charles Heddle*, so that as I take it these were the preliminary *streams* of wind, to which I have before adverted in former memoirs, which precede as I suppose the formation of a true vortex.* I have thus only marked the different midnight posi-

* I have more than once said in the course of these Memoirs, that these circular vortices must begin *somewhere* and *somehow*, and have suggested that they do so by *streams* of wind. From Mr. Rechendorf, a German gentleman educated as a mining

tions between these dates for reference, and pass on to Noon of the 22d, on which day we have only the *Charles Heddle* and *Appolline* on the southern side of *their* storm, for they were clearly in the same hurricane. The *John Adam* and *Sophia* were now of course far out of the influence of the threatening weather which they had experienced.

Centre of 22nd February.—As the *Charles Heddle*, at noon 22nd, had a hurricane at about ESE., and as we shall subsequently shew, was scudding in a circle of but little more than 60 miles radius, it follows that the centre bore about NNE. 60 or 70 miles, from her position.* We have not that of the *Appolline* to compare, but we find that she had the wind at E. by S. also blowing a hurricane, and was lying to, and as she could not be far from the *Charles Heddle*, I have placed the centre as it relates to the latter vessel only, which will also give the *Appolline* the wind as she had it, and on about that part of her drift, which is all we can mark for her, at which she was at this time.

Centre of the 23rd February.—We have at noon the *Charles Heddle's* position, as near as her corrected run will give it, and find that she was then on the Eastern range of her first circle, having the wind at North, and that this circle (see *post*) was of about 122 miles in diameter, or 61 miles radius; which distance to the West gives the approximate position of the centre of the storm for this day. A circle on the general chart cuts the *Appolline's* drift line to the West, as she was drifting that way, so as to give her a wind at about ESE. between which and SEbE. she had it by log. Her drift for want of data, is marked merely as a straight line, but she might have made more southing, and thus have been further from the centre, though on the same bearing from it, and with the same wind. We find on this day also that the *Commerce de Bordeaux*, first appears to have felt the hurricane, and this agrees well enough as to distance with our centre, which is at 140 miles from

Engineer, I had a curious account of the dust-whirlwinds, several of which in Upper India he had run after and penetrated. He describes them as forming a thick broad *wall* of dust, through which it was half suffocation to penetrate, but when in the centre it was nearly calm, with nothing but the wall of dust visible. He farther told me, that he had seen large ones commence, and that they did so in segments, which afterwards united. This is exactly our supposed "streams of wind," but then we know not if the causes on shore are the same; there may be two or more causes producing circular atmospheric motion.

* See however what is subsequently said as to the incurving winds.

her. Unfortunately we have nothing of this vessel's position beyond a bare notice and an imperfect log. The direction of the wind does not agree however very well with her position, the log giving SSE. veering to South, the point from which the hurricane commenced, and our centre shewing SSW. as the wind with her at noon. I think it however not improbable, and indeed most likely, that this vessel had a separate storm, for it is difficult to suppose that she could have fallen into the *Charles Heddle's* and gone through the veerings and scuddings her log shews, without the vessels having seen each other, but an ignorance of where she was when the storm terminated, makes every thing uncertain about her.

For the centre of the 24th February.—We have the *Charles Heddle* on the northern periphery of one of her circles, of which on this day the radius does not appear to have exceeded thirty-five miles. She had the wind about WbN. at noon, which places the centre SbW. from her, and this agrees perfectly with the *Appolline's* log, which ship had a furious hurricane at East and EbN. veering to NEbE. or three points, by 3 P. M. or in three hours, which with her low Barometer 28.4, shews she was also very near to the centre.

For the centre of the 25th February.—We have the *Charles Heddle* scudding on the West side of one of her circles, with the wind at about SbE., and the radius of the circle about twenty-six miles for this day, the bearing of the centre being therefore EbN. of her. This agrees perfectly with the position of the *Arpenteur*, with which vessel the hurricane begins this day at SE.; our circle making it SE. $\frac{3}{4}$ E. We have not the *Appolline's* wind, and but an indifferent position for her on this day, so that she may well have been a little farther from the verge of the circle than she is marked. The Northerly veering of the wind with her from noon 24th, though without any marked rise of the Barometer till the next day, is exactly what *should* occur with a vessel hove to in her position, and a storm (in the Southern Hemisphere) passing her to the westward.

For the centre of the 26th February.—We have the *Charles Heddle* on the NE. quadrant of a circle of twenty-five miles radius, with the wind about NWbW. placing the centre to the SWbS. of her. The *Appolline* had now fine weather. The *Arpenteur*, which vessel had the hurricane from the SE. and SSE. and was hove to, had the wind SSE.

till 2.20' P. M. on this day when it became calm and shifted to the NW. that is to say, the centre passed her (or she drifted across it?) *to the eastward* of her position at that time.

We have not her position at noon this day, and I have therefore estimated it only, by allowing her to have drifted bodily to leeward at the rate of three miles per hour on a West, WNW. and NW. course, which will give, with variation and a current of 2' per hour to the SW. a course and distance of N. 85° W. 90 miles, which is the best estimation we can make. I have not allowed her the full current which the *Charles Heddle* experienced, because as I shall elsewhere shew, I do not at present* think it probable, that the effect of the Storm Wave extends strongly to any great distance from the centres, though the storm *Currents* are felt all over the vortex.† The *Arpenteur* certainly did not partake of the *Charles Heddle's* storm wave to the SW. for her position on the 27th is about what a vessel might have been drifted to by the mere effects of the hurricane and storm *Currents*.

For the log of the 27th February.—At noon the *Charles Heddle*, though she had made one more turn round her circle since the 26th, appears to have the fine weather commencing, *i. e.* at length to have scudded out of the hurricane; or it might have left her. She appears at noon to have had the wind about EbN. which would give the centre bearing NbW. from her, and I should consider, though the *average* of this day gives but twenty-five miles, yet that by this time, Noon, she was at a much greater distance from it, the weather now beginning so evidently to be fine. We shall thus not be far wrong, if we say that at noon the centre bore NbW. forty-five miles from her; this distance, forty-five miles, being it will be seen, the average distance of the whole five days, and it will be noted on the chart, that this still keeps her, as our averages shew, within about twenty-five or thirty miles of the centre till about six A. M. when she begins to increase her distance from it, so that it is probably very close upon the truth. This position for the centre will place the *Arpenteur*, which also had fine weather returning from 3 A. M., at sixty miles from the centre, with about a SWbS. wind, if she still partook of the same hurricane.

* I say *at present*, because it is not wholly impossible that this view may be modified. At present all the facts we have, appear to tend to this supposition.

† The reader will find the word *storm wave*, and *storm current* explained in the Eighth Memoir, Jour. As. Society, Vol. XII. p. 398.

There is however one anomaly here, which we must note. In this twenty-four hours, as I have above remarked, the *Charles Heddle* clearly scudded round the last of her circles, between Noon 26th and 5 A. M. 27th, and at the same time, that is, between Noon 26th and 3 A. M. 27th the *Arpenteur*, at an average distance of thirty miles from her, also *drifted* round a circle, having the winds it is said "all round the compass." Now this evidently could not be the same vortex, and we must therefore suppose that, as has been so often shewn before, the storm here divided, which may have been the prelude to its breaking up? I have therefore marked two centres and two circles for the 26th and 27th, and my readers will judge for themselves of the probability of their truth. It is possible however, as the *Arpenteur's* log is but very loosely written, that there may have been only a series of varying streams, not enough to be evidence of a true circle.

We have no data for tracing the storm farther to the Westward, and I shall now advert to its rates of motion as shewn by our centre, and their relation to the *Charles Heddle's* spirals. The rates as shewn by the projection on the chart then, are,

22nd to 23rd	70	Miles.
23rd to 24th	100	"
24th to 25th	115.	"
25th to 26th	89	"
26th to 27th	85	"

5) 459

Per day 92 Miles.

Per hour 3 8

THE LOG OF THE "CHARLES HEDDLE," SEPARATELY CONSIDERED.

See Plate II.

So many interesting questions must arise in the mind of every seaman and of every scientific man, though not a seaman, in examining this log and the diagrams which I have given in Plate II, that I have thought it proper to devote a separate section to their consideration. They would almost indeed afford materials for a separate Memoir.

And first let me say, that, writing alike for the seaman and landsman, I shall endeavour to make myself quite clearly understood by the latter, and may thus at times appear prolix, or ostentatious of professional

knowledge; but as this detail is necessary to a thorough understanding of the subject by all, I cannot dispense with it.

The points for consideration then, are —

1. The accuracy of the *Charles Heddle's* log as a whole, and in its parts.

2. The nature and strength of the current she experienced."

3. The construction of the Diagrams in Plate II, from the log.

4. The sizes and probable forms of the vortices round which she scudded on different days, and her distance from the centres.

1. *The accuracy of the Charles Heddle's Log*, may certainly, I think, be taken as being as great as the circumstances would allow. Captain Finck is known at the Mauritius as an experienced and a careful seaman; and to this indeed his log bears full testimony; but there are many circumstances which (on board a merchant ship particularly) would unavoidably induce a less degree of accuracy than on board a man-of-war in like circumstances; and taking it that she was steered as correctly as a vessel could be steered in such weather, and perhaps even from her fine qualities as a sailer *better* than some men of war, the first question in the mind of a sailor is—"Yes; but how often was the log hove in such weather?" We should reply to this, first, that in the hands of many (young) officers, in such weather, and when running from 10 to 13 knots, the common log is as liable to error even if it was hove, as the guess of the experienced seaman. We have all known a young, or a careless officer report a ship going nine, when she was going ten knots, and especially at night, when it is not easy for the person heaving the log to have one eye, and a hand to the line, and the other to the holder of the glass, who is often half asleep; or on the other hand, that a fault in paying out the line too fast, or want of quickness at the glass or line may give eleven knots when ten or ten and a half are the truth; and in fact most seamen heaving the log really make their own allowance for any deficiency or excess they may suppose from any cause, and mark the run accordingly. I speak here of the common log only, and not of the patent ones, which are doubtless far more correct. But in the end, one error of our guess or measurement by log corrects the other, and we may, I think, fairly say that, though doubtless in such a hurricane of five days' duration the log was not hove with any regularity, and especially during the night, yet *the average of any day's run* is not far from the truth as to distance? The latitudes as given are the next consi-

deration, and here I think we may fairly reject the latitudes, and consequently the longitudes, given on the 25th and 26th, for it is difficult to suppose between the "frightful sea," (a literal translation) the motion of the vessel, the mere glimpses of the sun obtained in such weather, and often, if any horizon is seen, the difficulty of knowing if it be the true one, that any correct observation could be obtained. For the same reasons also, the hurricane still continuing, I should attach so little faith to the observation of the 26th, that I have preferred rejecting them both, and taking the two positions of Noon on the 22nd and Noon 27th as fixed and well ascertained points, by which to estimate the *average* current experienced for the whole five days; and I think every seaman will agree with me, that this is the safest course as to probability, and consequent approximation to the truth.

2. *The nature and strength of the current she experienced.*

When the *Charles Heddle's* log is worked for the whole five days with simply the allowance for variation,* she will be found to have made good, as noted on the Diagram Fig. I, a course of *North 42' E.* distance 111', in the five days from November 22nd to November 27th; but by her Chronometer and observations she had really made good, as in Diagram Fig. II. a course of *South 55° W.* 366'. So that she must during the five days have experienced a current of *S. 52° W.* 476 miles! or in round numbers, (which would require 480 miles,) four miles per hour for the 120 hours, or five days, of the hurricane. I have already explained why I should reject wholly the observations on the intermediate days, and this compels us to take the whole as a general average, being without any positive knowledge as to whether its force or direction was different on different days. It is clear that if the direction was

* There is considerable uncertainty as to the variation in this tract between Bourbon, the Mauritius and the coast of Madagascar. On this last coast it is marked in Norrie's Tables, ed. of 1844, which I take to be from the latest authorities, as 16° Westerly at Foul Point, latitude 17½ S.; and as 21° Westerly at Fort Dauphin, in latitude 25° S.; and at Mauritius as 14° 20' West, but we do not know how late this is, and if the variation is increasing or diminishing; and I have not access to any very late works or charts. I have thus allowed 1½ points for the first three days, and 1¾ points for the last two. This may be slightly erroneous, but we do not know any thing as to what may have been errors of steerage, misplacing of compasses, and local variation, and ¼ of a point more or less for a day or two would not make any difference in this kind of circle sailing, as I have satisfied myself by working over the logs of 23d and 24th with 1½ point variation, when the result for the two days was only three miles South and four East of that given by the variation used, which is quite insignificant either as to general results or the projections of the Chart and Diagrams.

at all different, the force of the current must have been greater, as the distance taken is the straight line between the points, and any deviation from that must make a greater distance. In as far then as *rate* is concerned, we have (supposing the run to be on the whole correctly estimated) taken the lowest.

3. *The construction of the Diagrams in Plate II from the log.*

The seaman will easily understand these (and I hope appreciate the tedious labour they cost), but writing for the meteorologist, and general reader also, I must explain that Fig. 1, is simply the courses and distances of the log corrected for variation, and laid down on a plane chart.

For Fig. II. every *separate* course and distance was first worked as for a traverse, and then to it was applied the average current of S. 55° W. four miles per hour, for the number of hours of run on that course, and this *corrected* course and distance, taken as being the true one, was then laid down; and the result of all these produces from point to point of the five day's scudding, the singular set of spirals shewn in the Diagram!* And these are in all probability not far from the average truth, as we shall now shew.

The size and probable form of the vortices round which the Charles. Heddle scudded.

There are three kinds of calculations to be made as to the size of the vortices. The first is to take the number of turns made in the *whole* five days against the *whole* distance run by log, and taking this as representing the sum of the peripheries of so many circles as there are turns, the result divided by the number of turns will give the *average* size of the circles, and consequently from their diameters the *average* distance from the centre at which the brig scudded.

The *second* is to consider each *separate* turn or circle made according to the log, with the number of hours employed, and distance run in making it, and to use this to determine the probable Diameter of the circle sailed round; and the *last*, which will perhaps assist us in forming a notion of the shape of the vortices, to take each *half* circle only to calculate from in the same way. I shall shew the result of each of these calculations, premising that I take the circle or half circle to be com-

* The points marked with dates on the diagram are the positions of the vessel at noon each day; and are those taken for the same days on the general chart also.

pleted at the nearest time and distance to which the log allows us to calculate it.

First, it appears then that from November 22nd to November 27th, the *Charles Heddle* completed as follows :—

	1st Turn in	24 hours,	running	387	Miles.
	1	„ 38	„	426	„
	1	„ 23	„	243	„
	1	„ 17	„	167	„
	1	„ 15	„	150	„
	<hr/>				
Sums,	5 turns in	117 hours,	„	1373	Miles.
	<hr/>				
Means are	1 turn in	$23\frac{2}{5}$ hours,	„	$274\frac{3}{5}$	Miles.
	<hr/>				

The *average* circle then was $274\frac{3}{5}$, or say 275 miles in circumference, which would give not quite 90 miles of diameter, and the Brig's average distance from the centre, being the half of this, at about forty-five miles.

Again, five turns of the circle are 160 points, which in 117 hours are 1 point and three-quarters in an hour, and the 1373 miles divided by 160 are 8.6 miles of distance for each course, or chord of each arc. Taking every separate turn we have,

	Diameter.	Distance from the centre.
1st Turn, 387 Miles of circumference, or	123.3	61.6
2nd „ 426	135.5	67.7
3rd „ 243	77.3	38.7
4th „ 167	53.2	26.6
5th „ 150	47.7	23.8
	<hr/>	
	437.0	218.4
	<hr/>	
Average,		44.6

Taking every separate *half* turn, which is suggested by the evident tendency of the spirals, and choosing from the log each half circle from WNW. to ENE. by compass,* and from ENE. to WNW. again, we have first,

* About, or $W.\frac{1}{4}N.$ and $E.\frac{1}{4}S.$ true course, on an average.

		Hours.	Miles.	Circle of	Mean.	Diamr.	Distance from the centre.
1st turn	22nd	{ 1st half circle.	14	167 334	395	125.5	62.7
		{ 2nd	19	228 456			
2.	23rd	{ 1st	12	127 254	373	119.	59.5
		{ 2nd	19½	246 492			
3.	{ 24th and	{ 1st	9½	103 206	214	68.	34.
	{ 25th	{ 2nd	11	111 222			
4.	{ 25th and	{ 1st	6	60 120	160	51.	25.5
	{ 26th	{ 2nd	11	100 200			
5.	....	{ 1st	5½	55 110	135	43.	22.5
		{ 2nd	8	80 160			
							204.2

Averaging, 41.

This table gives us then the daily and the average diameters of the circle sailed round on different days from North to South, or thereabouts. The following is the result when we begin with the time (8 P. M. 22d,) at which the vessel was running about North (NNE. by compass) and is thus a measurement from East to West; or at right angles to the preceding one.

		Hours.	Circle of	Diameter.	Dist. from centre.
1st Turn,	{ 1st half circle.	17 — 204	406	.. 129.2 ..	64.6
	{ 2nd	18 — 202			
2d Turn,	{ 1st	19 — 213	361.5	.. 115.0 ..	57.5
	{ 2nd	13½ — 148.5			
3d Turn,	{ 1st	11 — 112	193	.. 61.4 ..	30.7
	{ 2nd	8 — 81			
4th Turn,	{ 1st	10 — 96	156	.. 49.6 ..	24.8
	{ 2nd	6 — 60			
5th Turn,	{ 1st	8 — 80	160	.. 50.0 ..	25.0
	{ 2nd	8 — *80			
					202.6
					40.5

The above averages it will be noted are derived from the run by Log.

There is a third average to be derived from the *measurement*, on the Diagram, of the distance between the parallels nearest to the longest, or vertical, or North and South diameters of each spiral on Fig II, which are those nearest the meridians. The transverse (minor) or East

* This is incomplete: the log of the 27th closing, as before noted, at a West course, and the weather becoming fine; I have therefore *supposed* the latter half of the circle.

and West axes of the spirals, or those bounded by the nearest courses to the meridians *appear at first sight* to be reduced by the effect of the current, and the longer (major) axes also appear reduced by the crossings of the old track from the same cause, but the letters *A* to *B*, *B* to *C*, &c. and *a* to *b*, *b* to *c*, &c. will show the measurements taken, the first being near the meridional, the last near the horizontal distances. Measurements of these parallels are also taken, as in the former case, twice for each circle to obtain a fair average, and are for the vertical axes.

					Mean Diameter.		Mean distance from centre.		
1st.	{	1st	<i>A</i> to <i>B</i>	112	}	..	110	..	55
		2nd	<i>B</i> to <i>C</i>	107		..	..	..	..
2nd	{	1st	<i>C</i> to <i>D</i>	85	}	..	123.5	..	61.7
		2nd	<i>D</i> to <i>E</i>	162		..	..	..	..
3rd	{	1st	<i>E</i> to <i>F</i>	77	}	..	75	..	37.5
		2nd	<i>F</i> to <i>G</i>	73		..	..	..	..
4th	{	1st	<i>G</i> to <i>H</i>	45	}	..	54.5	..	27.2
		2nd	<i>H</i> to <i>I</i>	64		..	..	..	..
5th	{	1st	<i>I</i> to <i>J</i>	47	}	..	54.	..	27
		2nd	<i>J</i> to <i>K</i>	61		..	..	..	..
						Mean.		41.7	

When the same kind of measurement is taken between the extreme *meridians* of the spirals, or from east to west, the results are as follows:—

NEWS.

		Mean Diam.		Mean distance from the centre.
1st Turn,	$\left\{ \begin{array}{ll} a \text{ to } b & 92 \\ b \text{ to } c & 182 \end{array} \right\}$	..	137	.. 68.5
2nd Turn,	$\left\{ \begin{array}{ll} c \text{ to } d & 89 \\ d \text{ to } e & 146 \end{array} \right\}$	..	117.5	.. 58.7
3rd Turn,	$\left\{ \begin{array}{ll} e \text{ to } f & 33 \\ f \text{ to } g & 77 \end{array} \right\}$	..	55	.. 25.0
4th Turn,	$\left\{ \begin{array}{ll} g \text{ to } h & 35 \\ h \text{ to } i & 72 \end{array} \right\}$	..	53.5	.. 26.7
5th Turn,	$\left\{ \begin{array}{ll} i \text{ to } j & 28 \\ j \text{ to } k & * \end{array} \right\}$			
				<hr/> 178.9
				<hr/> 44.7

It is evident here that the second half circle is affected by the current which in the run during the first half is against the vessel, diminishing the breadth of the circle, and in the second half is in favor of, and increases it; making thus double the difference. The average however singularly agrees with the others, as will appear in the following general table.

* Incomplete as in page 725, and the blank cannot be supplied here.

The following is the result of these various modes of estimating the diameters of the Circles, and the average distances from the centre during each revolution sailed by the Charles Heddle.

Date.	Revolution Completed.	By separate turns Average.	Log By half turns, WNW. to ESE.	Log. By half turns, North to South.	Diagram with correction for current, Fig. 11.	
					By Meridional axes of spirals.	By Horizontal axes of spirals.
		Diam. Dist. from centre.	Diam. Dist. from centre.	Diam. Dist. from centre.	Diam. Dist. from centre.	Diam. Dist. from centre.
	1st	123 61.7	125.5 62.7	129.2 61.6	110. 55	137. 68.5
	2nd	135 67.7	119.0 59.5	125. — 57.5	123.5 61.7	117.5 68.7
	3rd	77.3 38.7	68.0 34.0	61.4 30.7	75. 37.5	55.0 25.0
	4th	53.2 26.6	51.0 25.5	49.6 24.8	54.5 27.2	53.5 26.7
	5th	47.7 23.8	43. — 22.5	50. — 25.0	54. 27.	Imperfect
	Mean Average distance from centre,	44.6	41.0	40.5	41.7	44.7
			Mean of the whole by log is	Mean of the first two days by log is		
			by chart, ..	by chart, ..		
			42.0	62.3		
			43.2*	60.9		
				Mean of the last 3 days by log is		
				by chart, ..		
				27.9		
				28.2		

* By the whole distance run (p. 724,) and number of turns, the average distance from the centre on the whole five days is 45 miles.

We arrive so near to the same results by all these different modes of calculation, that we can entertain no reasonable doubt that they are not far from the truth, as shewn by the original data, and that the vessel made in round numbers

1. In the first two days, circles of about 125 miles in diameter, and was sailing round at an average distance of $61\frac{1}{2}$ miles from their centre, the greatest distance being 68 and the least $57\frac{1}{2}$ miles.

2. That for the last three days she was sailing round in circles of about 56 miles in diameter, and consequently at a distance of 28 miles from the centre, the greatest distance being 39 miles, and the least 25.

It appeared to me also interesting to know for how many hours during these five days each wind blew; so as to obtain an idea of what the total *resultant curve of the winds* was, independent of the run of the ship. I explain these terms. By the total *resultant* of the winds is meant in meteorology the calculating each separate wind during the number of hours it blows in a given time, its direction being in nautical language a course, and the time or number of hours a distance; the strength being always supposed the same (or this may also be used,) and all these courses and distances, (direction and time,) may make a traverse table, of which as usual one course and distance is the result. Thus if in 24 hours we have 9 hours of NE., and 15 of SW. wind, the resultant is 6 of SW. Wind; or the whole atmosphere of the place may be supposed to have moved for 6 hours to the N. E., if the strength of the two winds was always equal. This is the *resultant* of the wind. If instead of the traverse table we project the directions of the wind for courses, and the hours it blew for distances, we shall have a line of some kind, which in this case is a curve, and this is the *resultant curve* of the wind. Now in the run of a vessel scudding under bare poles her run per hour may be supposed to be an indication of the strength of the wind, but then, the course and distance shewn by log becomes the resultant, indicating from which quarter also the resultant wind blew, and this, as shewn already, is to the N. 42° E. by the log, Fig. I. It is true that the vessel being always carried to the SW. by the current shewn beyond doubt to have existed, this result is not so valuable as it might have been had no current existed, but it nevertheless has appeared to me to be one worth investigating, as giving an

average of winds as prevailing along the track and close to the centre of the storm for the whole five days.

This summary then, is as follows, beginning with the log of the 22nd, 23rd, which is at Noon 22nd by Nautical time, and ending at Noon 27th. The winds being given by compass are corrected for $1\frac{1}{2}$ point of Westcrly variation, to enable the reader better to compare the curve with Figs. I. and II.

Winds.	Per log hours.	Corrected for Var.	Traverse.			
			N.	S.	E.	W.
North*	.. 8 ..	NbW $\frac{1}{2}$ W.	.. 7.7	..	..	2.3
NNE.	.. 4 ..	N $\frac{1}{2}$ E.	.. 4.0	..	0.4	..
NE.	.. 4 ..	NNE $\frac{1}{2}$ E.	.. 3.5	..	1.9	..
ENE.	.. 10 ..	NE $\frac{1}{2}$ E.	.. 6.3	..	7.7	..
East,	.. 7 ..	EbN $\frac{1}{2}$ N.	.. 2.0	..	6.7	..
ESE.	.. 4 ..	E $\frac{1}{2}$ S.	.. ..	0.4	4.0	..
SE.	.. 6 ..	SEbE $\frac{1}{2}$ E.	.. ..	2.8	5.3	..
SSE.	.. 10 ..	SE $\frac{1}{2}$ S.	.. ..	7.7	6.3	..
South,	.. 11 ..	SbE $\frac{1}{2}$ E.	.. ..	10.5	3.2	..
SSW.	.. 7 ..	S $\frac{1}{2}$ W.	.. ..	7.0	..	0.7
SW.	.. 8 ..	SSW $\frac{1}{2}$ W.	.. ..	7.1	..	3.8
WSW.	.. 7 ..	SW $\frac{1}{2}$ W.	.. ..	4.4	..	5.4
West.	.. 9 ..	WbS $\frac{1}{2}$ S.	.. ..	2.6	..	8.6
WNW.	.. 10 ..	W $\frac{1}{2}$ N.	.. 1.0	..	..	10.0
NW.	.. 8 ..	NWbW $\frac{1}{2}$ W.	7.1	..	..	3.8
NNW.	.. 7 ..	NW $\frac{1}{2}$ N.	.. 5.4	..	..	4.4
120 hours, or five days.			37.0	42.5	35.5	39.0
				37.0	..	35.5
South.				5.5		3.5W.

Which gives as the resultant wind South 32° W. 6.5 (hours) in 120h. or $\frac{2}{37}$ of the whole time or run, and as the run was in ~~all~~ 137 miles, this would give 74.4 miles, calculated in distance.

* Nautical men will notice that the vessel is always marked as changing her course *two* points. I suppose she was steered as long as possible with the wind veering a little on the quarter and then the gradual alteration taken as an average, as is often done in cases of squalls of long duration obliging a ship to bear up. At p. 724 it will have been noted that $1\frac{1}{4}$ point per hour is the average change.

Now the course and distance made, corrected for }
 variation shewn by the log, is. } N. 42. E. 111.

That shewn by the average wind is, S. 32° W. for }
 6.5 hour, or } N. 32. E. 74.4.

the difference being occasioned by the varying *distances* made in the different times, arising from the varying strength of the wind, and the effect of the current. The result is always of great interest, for it proves that the vessel, to counteract the current, was obliged to run for one-tenth of the whole time, or ten hours *extra* in the SWbW. winds (S. 55° W.), and thus though it does not prove that the wind *was* less strong on the one side (the NW. side) of the storm circle than on the other, it shows that the current *must* have existed to a great extent.

The resultant curve made by the average of these different winds for the whole five days is also worth attention, and I have projected it in Fig. III. taking the hours for distances. If this, and Fig. IV. (which are on a larger scale than the other diagrams,) be considered attentively with them, we may, I think, without presumption say that, as they are the only MAPS OF THE WINDS in such a hurricane yet traced out, so it will, I fear, be long before we obtain such another.

Its form is also that which theoretically we should say it would assume ; for if we suppose a vortex of air of any size moving through the air (like a dust whirlwind) we should imagine it to be liable to be *flattened* in on the foremost, and elongated on the following side, and this ours evidently is. If we suppose that the vortex is not one of independent atoms of air moving forward, but of atoms in their usual places to which a rotatory motion was successively given, like the undulatory movements of particles of water, the same flattening might still occur, though to a smaller degree, and in a different part of the circle.

A somewhat different curve would be shewn by the number of hours of wind in the five days, with the distance run to each, as shewing the *strength* of the wind ; the vessel being for the whole time under bare poles.* The resultant of this which is projected at Fig. IV. will be that of the three elements, direction, time, and force, and it will also be *the average of all the curves* of Fig. I. The table is as follows,

* And her resistance operating on a large scale like the counter-spring or weight, and friction of an Anemometer.

and I allow for it the same variation, $1\frac{1}{2}$ point, as in Fig. III. the $\frac{1}{4}$ of a point more allowed during the last two days in the log making, as before shewn, no difference worth noting.

Table of the distance run with each wind.

	Winds per Log.	Hours.	Corrected for Var.	Distance run with that wind.
12	North, ..	8	.. NbW $\frac{1}{2}$ W.	.. 85
13	NNE. ..	4	.. N $\frac{1}{2}$ E.	.. 40
14	NE. ..	4	.. NNE $\frac{1}{2}$ E.	.. 43
15	NNE. ..	10	.. NE $\frac{1}{2}$ E.	.. 111
16	East, ..	7	.. EbN $\frac{1}{2}$ N.	.. 87
1	ESE. ..	4	.. E $\frac{1}{2}$ S.	.. 57
2	SE. ..	6	.. SEbE $\frac{1}{2}$ E.	.. 65
3	SSE. ..	10	.. SE $\frac{1}{2}$ S.	.. 94
4	South, ..	11	.. SbE $\frac{1}{2}$ E.	.. 109
5	SSW. ..	7	.. S $\frac{1}{2}$ W.	.. 77
6	SW. ..	8	.. SSW $\frac{1}{2}$ W.	.. 89
7	WSW. ..	7	.. SW $\frac{1}{2}$ W.	.. 75
8	West, ..	9	.. WbS $\frac{1}{2}$ S.	.. 100
9	WNW. ..	10	.. W $\frac{1}{2}$ N.	.. 101
10	NW. ..	8	.. NWbW $\frac{1}{2}$ W.	.. 88
11	NNW. ..	7	.. NW $\frac{1}{2}$ N.	.. 71

There are farther considerations arising out of these results. We are much puzzled when we consider a vortex of air simply as whirling round and without any progressive motion, to say whether there would be a centrifugal or a centripetal tendency? or a mere circular one, throughout? or even centrifugal at the circumference and centripetal towards the centre?

The laws of physics would certainly indicate a centrifugal force, and we usually suppose then an attraction to counterbalance this; or again, the mind reverts to the apparently well observed and attested accounts of water spouts and whirlwinds, which all seem to lean to the fact of these small vortices, at least, having rather a centripetal than a centrifugal force; that is, a particle of air or dust in the neighbourhood would be drawn farther and farther inwards. Our present result is evidently to shew this sort of incurving, *and the diameter of the storm was a decreasing one!*

The consideration of Fig. III. in this point of view, leads I think to a practical result of some, or perhaps much importance ; I consider it thus,

We see clearly that from X to Y in Fig III. and from *x* to *y* in Fig. IV. the whole tendency of the winds was to form a *converging* spiral, and not a *diverging* one, or in other words, a circle of which the wind-arrows would turn inwardly and not outwardly.* Now we can have no manner of doubt I think that this storm was one of those which, as I have previously shewn, is really the case (See Journal, Vol. IX. Coringa hurricane) was contracting in its progress, and not dilating as many do.

Is it then the case that, when the storm contracts, the wind forms a converging spiral, and E CONTRA if it is a dilating storm, the spiral is a diverging one ? We are induced to think this highly probable, and apart from the great interest of it to the meteorologist, if we find it to be the case, it becomes of high importance to the accuracy of our investigations, and moreover to the practical application of the Law of Storms for the purposes of the Mariner ; and it is so from the influence which it has on the true bearing of the centre.

An example will best shew this.

If we suppose a contracting storm, *i. e.* one which has a tendency to *diminish* in size as it proceeds, of 320 miles in circumference, each arc from point to point of the compass of such a circle will have a chord of something less than ten miles ; across which we may supposed a scud-ding ship to run with one wind till it suddenly or gradually changes to another. But according to the hypothesis that the contracting storms are composed of winds converging to the centre, and not of arcs of a complete circle, we may suppose that each of these thirty-two winds and the corresponding chords of their arcs, which are the ship's courses, are also, not perpendiculars to a radius from the common centre, like true tangents, but to the radii from a *succession of centres*, which are disposed round the common centre ; in a word, that *they* converge inwardly also, like the wind-arrows on our charts.

In the Northern hemisphere they will probably converge inwardly to the left. In the Southern hemisphere to the right? How *much* do they converge is the next question ? for its reply will give us this datum. *The allowance we should make to ascertain the true bearing of the centre in projecting, and even in estimating its position at sea.*

* Our figure approaches to the volute of an Ionic capital.

It may be possible to estimate this; approximately at least.

Let us take our circle of 320 miles, and consider the chords of the wind arcs in a *true* circle as forming a polygon of 32 sides, or points.

Now in our Fig. III. the amount of incurving at the two points is about seven miles for an average circle, say, of forty-five miles.

The diameter of our circle of 320 miles is (in round numbers always) 102 miles, so that, at this rate of incurving, we may say that the total would be in the same proportion, sixteen; *i. e.* $45 : 7 : 102 : 16$.

Now sixteen for 32 points is exactly half a mile for each point, and the chord of each arc of one point is 10.5. An incurving of half a mile in such an arc would give about 5° , or say half a point.

In a circle of 200 miles in diameter, on which a ship would only be at 100 miles from the centre (at which time in our Bay of Bengal and China Sea Hurricanes a storm is usually fully and unequivocally manifest) the whole incurving would be thirty miles; let us say thirty-two, or a mile for each point.

Now the incurving of a mile to each point would make a difference on each arc of about 3° only in the direction of the chord, or say a quarter of a point: so that here it would not make much difference. But we may suppose that the incurving is double what we have here assumed, or even more;* and then the difference as to the bearing of the centre might be a point, *i. e.* a vessel in the Northern hemisphere with a hurricane commencing at East, would have the centre bearing, not South but SbE. from her; and if we suppose this on a circle of 320 miles circumference as before, this would for our purposes, in protracting the winds and ship's place for the centre, make it rather more than 10 miles to the Eastward of its situation if there was no incurving; and if we again estimated this centre by the cross bearing from the winds of another ship on the Eastern edge of the same circle having the wind at South and the centre supposed to bear (without allowance for incurving) West, it would really bear *with* this allowance of the incurving WbS. and the position found by these allowances for the incurving winds would be 14 miles to the SE. of that shown without it!

I think this may often account for many of the discrepancies we have found in reconciling the ship's positions, winds, and bearings of the centre.

* Is the rate of veering of the winds (in this case, see p. 724, $1\frac{3}{4}$ point per hour) any index to the amount of incurving?

At present it is of course a mere theory, but the fact on which it is based, viz., the average incurving tendency of the winds in the *Charles Heddle's* storm seems fairly enough elicited, and to call for close attention.

Like all theories it will serve us as a torch and a partial guide for the present, and we must wait for more facts, to show if it be well founded.*

If (for the sake of hypothesis only) we admit this incurving of the winds, it follows that there may be also, not a single incurving of the same rate throughout the whole breadth of the storm, but that the incurving may be much more excessive, and amount to two or three points when the centre is nearly approached, and even be *so violent at the centre as to prevent ships drifting out of it?* just like the vortex of a whirlpool or a tide-eddy, which last we know will often give a boat's crew a heavy pull, or a ship much trouble, before they get out of them. Does it not seem that we have here the explanation of how some ships, as in the case of the *Runnime* and *Briton* in my last memoir, may be blown and drifted round and round, without drifting *out* of the fatal centre, which we should look for them, nautically, to do, and which other ships there is no doubt really do. An excessive incurving of the winds towards the centre, like the wind-arrows at the centres of Fig. III. and IV. is one, and one very likely method of accounting for vessels remaining in this hopeless state, and moreover it may assist us in supposing how some dismal losses have occurred whilst other ships in company have escaped. It adds also a most powerful argument, if any were wanting, for every precaution to avoid the centres—and for every one who can contribute to these researches to do so.

It is possible that at some periods of a storm, the state of it may be such that there is a centrifugal tendency at the circumference, and an incurving or centripetal tendency near the centre, and that at some point in the whole zone of the storm the winds are blowing in a true circle? All this is matter of high interest to us, and for future careful research. I have perhaps been prolix in this section, but if I have been so, I trust it will be attributed to my anxious desire

* I may notice here, that in my Third Memoir, Journal As. Society, vol. ix. p. 1047, in noticing the anomaly of the *George and Mary's* log, I have suggested theoretically that the storm *might* have divided. We have since abundant proof, that this frequently occurs in the Bay of Bengal, as seen in succeeding memoirs.

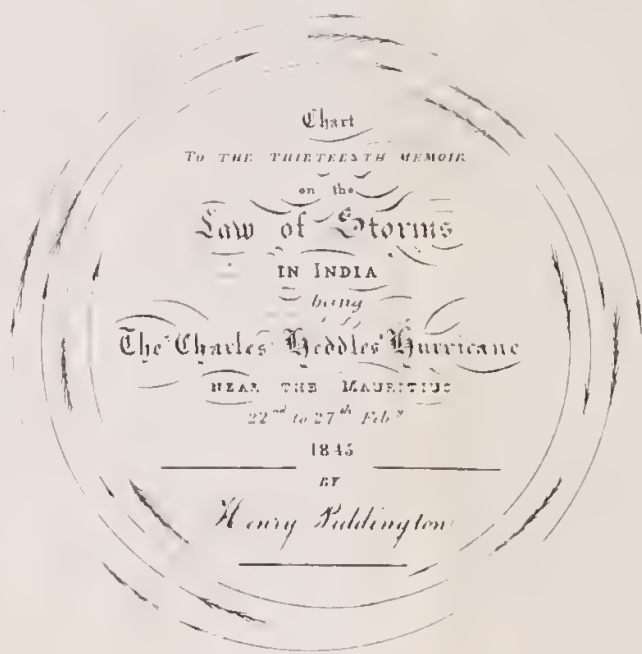
10°

55°

60°

10

Plate 1



Gulega I.

Says de Malha

Sophia

Midnight

21st John Adams21st Ranger20th19th Feb^r

Cargados

Garajos

15°

15°

23rd Commerce de Bordeaux Hurricane commencedFeb^r 20th20thCentre 23rdCentre 22ndMidnight 21st 22nd

Appoline

21st Feb^r

Midnight

21st Feb^r

Th. Heddles

Argentine

Centre 25thCentre 26thCentre 27th

Port Louis

Mauritius

Rodrigues

Reunion

50

55°

60°

64

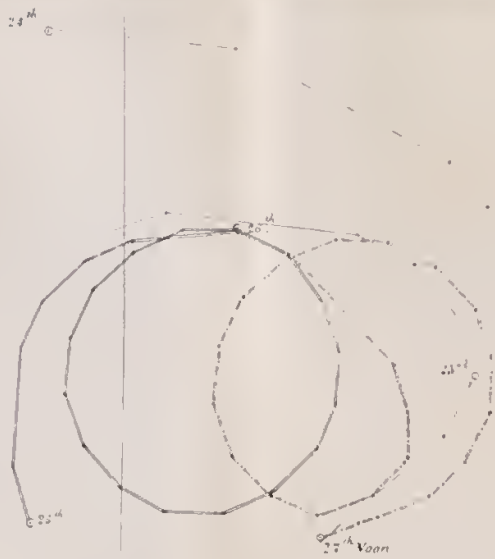


Fig I
Traverses
of the Charles Heddle
corrected for Variation only
22nd to 27th Feb^r
1845

Course & Dist^s P^r Log
4° 42' E III miles
Scale 50th to an inch

Track of the Storm

Scale of 50th to an inch

From Feb^r 22^d To Feb^r 27th
Lat obs^d 16° 42' S Lat obs^d 20° 12' S
Long obs^d 57° 45' E Long obs^d 52° 24' E

Centre and Distance by Observation N 55° W 50 miles



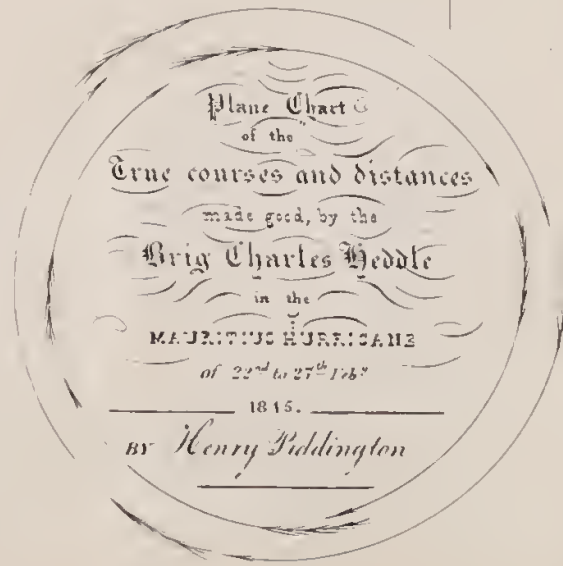
Fig III.

Resultant curve of the total of the winds in time
22nd to 27th Feb^r 1845. 5 Days - 120 hours
Scale 20th to an inch Variation allowed 1/2 Points

Fig IV



Resultant curve of the total of the winds in time
and distance 22nd to 27th Feb^r 1845. 5 Days
Scale 200 Miles to an inch Variation allowed 1/2 P^t



to urge the subject on the minds of others, and to elicit their views as well as my own.

Conclusion.

Every man and every set of men who are pursuing the investigation of any great question, are apt to overrate its importance; and perhaps I shall only excite a smile when I say, that *the day will yet come when ships will be sent out to investigate the nature and course of storms and hurricanes*, as they are now sent out to reach the poles or to survey pestilential coasts, or on any other scientific service; and it is to be hoped that England will in this, as in every other nautical investigation, take the lead, and that without waiting till some astounding misfortune shall force the investigation upon us. Nothing indeed can more clearly shew how this may, with a well appointed and managed vessel be done in perfect safety, than the experiment which the foregoing pages detail; performed by mere chance, by a fast sailing colonial brig, manned only as a bullock trader, but capitally officered, and developing for the seaman and meteorologist a view of what we may almost call the *internal* phenomena of the winds and waves in a hurricane,—and these as mathematically proved as the nature of things will allow,—which we could scarcely have hoped ever to have obtained. The importance of the questions which arise when storms are considered in any of their relations, in war or in peace, to a great Naval and Commercial Nation, and to mankind in general, cannot I think now be doubted.*

* While correcting this page for the press, we receive an account in the Newspapers of the dismal catastrophe of the loss of the Emigrant ship *Cataraqui*, at the entrance of Bass' Straits, in which 414 souls have perished in the prime of life! This vessel was evidently on the Northern side of a rotatory gale, and swept, in all human probability, by the storm wave, as in the analogous cases in the British Channel, far to the Eastward of any supposed possible drift.

Account of the Esafzai-Affghans inhabiting Sama (the plains,) Swat, Bunher and the Chamla valley, being a detail of their clans, villages, chiefs and force, and the tribute they pay to the Sikhs. By Sheikh Khush Alee, a follower of the fanatic Syud Ahmed. Prepared in 1837 under the instructions of Major R. Leech, C. B. Late Political Agent, Candahar.

[NOTE.—In Conolly's notes on the Eusofzye tribes of Afghanistan, Journal Asiatic Society, No. 105, 1840, page 932, it will be seen from the conclusion of the above paper, that it was but the intended commencement of a series; his object being to follow it up with a narrative of his journey in the Eusofzye country in January 1840. Will no one consent to supply what he has left incomplete?]

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of Match-lock men.	Amount of annual tribute paid to the Sikhs.
SAMA, (THE PLAINS.)				
Aba khel, ..	Zaida, ..	{ Arsala Sadozai, who has been made by the Sikhs, chief of } the Esufzais, ..	800 foot. 60 horse.	
Sapoo khel, ..	Ditto, ..	Saroor, Sahabee, Omer, and Lushkar, ..	200 foot.	
Maka khel, ..	Ditto, ..	Raheem and Sargund, ..	40 "	
Oosee khel, ..	Ditto, ..	Kaim, Kaboot, Humeer, and Sar Ally, ..	200 "	
Tajoo khel, ..	Haryam, ..	Faiztullah, ..	50 "	600 Rs.
Ditto, ..	Sala, ..	Sayad, ..	50 "	1,100 "
Ditto, ..	Nabee, ..	Najem, ..	60 "	500 "
Ditto, ..	Dekee, ..	Sarkan, ..	60 "	400 "
Apa khel, ..	Lahour, ..	Sargand, Atta Mahommed, and Ajab, ..	1100 foot. 20 horse.	{ 1,500 "
Doulat khel, ..	Kanda, ..	Asraf, Namdar, and Kaloo, ..	100 foot.	1,000 "
Ditto, ..	Shah Mansoor, ..	Husanally, Kaloo, Ahmed and Sahabzada, ..	200 "	1,000 "
Aba khel, ..	Hind jageer of Aisulla, ..	Ahmed and Fatted, (formerly Ameer,) ..	200 "	
Ditto, ..	Kaddee, ..	Ameer Shah Pusund and Hotee, ..	60 "	
Ditto, ..	Panch Peer, ..	Munaim, Juhangeer, and Motassam, ..	80 "	1,000 "
Omar khel, ..	Topai, ..	..	72 "	
Bizad khel, ..	Kalabut, ..	Ibrahim, Ismail, Biland and Seefut, ..	200 "	100 "
Ditto, ..	Kala, ..	Dillas, Feroz and Ner Ally, ..	80 "	500 "

Name of Clan, (Tuppai.)	Name of Village.	Name of Chief, (Malik.)	Number of Match-locks men.	Amount of annual tribute paid to the Sikhs.
Omar khel,	Darra, ..	Bahadur, Lita, and Peer, ..	80 foot.	500 Rs.
Ditto, ..	Swahee, ..	Omar, Chundun and Kasam, ..	80 "	800 "
Ditto, ..	Meneree khel, ..	Nawas, Mousum, Mohtum, Abdulla, and Jahangeer, ..	500 "	{ 1,500 "
Bizad khel,	Bajar, ..	Saleem, Jan, Nazalla, and Nousher, ..	50 "	{ Jageer to
Ahmed khel,	Marghoz, ..	{ Shahzada, Futteh, Khai-rulla, Saibaud, Ibrahim, Sajangdad } ..	250 "	{ Arsala.
Beet khel, Meer Ahmed {	Ler munara, ..	Vahabzida, Toorebaz and Abeel, ..	100 "	1,000 Rs.
khel, ..				
Ditto, ..	Baja, ..	Maizulla and Nouseree, ..	50 "	300 "
Ban khel, Khudoo khel,	Bara marghoz, ..	Noor and Darasha, ..	60 "	604 "
Budula khel,	..	Hasan, Bizad, and Jahan, ..	70 "	{ formerly
Eenoos khel,	..	Abee, and Nouseeree, ..	60 "	{ Jageer.
Zafur khel,	..	Enayutulla, Abdulla and Turah, ..	70 "	
Mada khel,	..	Jahangeer, ..	25 "	
Kasim khel,	..	Guzun, ..	60 "	
Osman khel,	..	Hasan, ..	25 "	
Moosa khel,	..	Sahabzada, Nouseeree, Zahurdust, and Samud, ..	200 "	1,900 Rs.
Meer Ahmed khel,	Tankooee, ..	Shekh, Rahmut, Sahbaz, Abbas, Mawallee, and Abdulla, ..	400 "	3,000 "
Kanazais Alazais, and {	Kota, ..	Maizulla, Mukarab, Zabardust, and Mahommad, ..	300 "	3,000 "
Ootmanzais, ..	Mainee, ..			
Oosmanzeis;	..			
<i>Ootmanzais, of Topee.</i>				
Nekazais, ..	..	Serzaman, Ahmed Ally, and Hussun Ally, ..	100 foot.	
Ala zai, ..	..	Kaim and Adam, ..	100 "	
Karca zai, ..	..	Biland, Azad and Akhtar, ..	200 "	300 Rs.

SIRDAR PUTTEH KHAN.—(Continued.)

Name of Clan, (Tuppai.)	Name of Village.	Name of Chief, (Malik.)	Number of Macth-lock men.	Amount of annual tribute paid to the Sikhs.
<i>Kanazais.</i>				
Kanazai, ..	1/2 Zer Kaya, ..	Abdulla, Hameed, Sirdar, Amar, and Azeez, ..	100 foot,	..
Akazai, ..	Ditto, ..	Sarandaz, Mahomud Ally, Adal, Ati, Azimulla and Hujoom, ..	100 "	..
Alazai, ..	Khabal, ..	Mouzam and Mahulla, ..	50 "	..
Ditto, ..	Kulagur, ..	Sahadeen, ..	100 "	..
Ditto, ..	Chalai, ..	Ameen, ..	50 "	..
Ditto, ..	Mungul Chhai, ..	Sayed, ..	60 "	..
Ditto, ..	Talorce, ..	Muneer, ..	40 "	..
Salar khel and Makazai } Gudoons, ..	Pahenee, ..	Syud Shah and Ashraff, ..	200 "	..
Utuzai, ..	Gandap, ..	Mouzandeen, Nazam and Abdullah, ..	200 "	..
Gudoons, ..	Badee, ..			
	Koolangar, ..			
	Chhalai, ..			
	Mangalchhai, ..			
	Talorce, ..		500 "	..
	Baisak and Dewal Key, ..			
Mansoorutappa Gudoons,	Baine, Gurree, Talee, ..	Maboolla, Moosezai, Maizulla, Eesa, Sitar, Mahumud Zameer and Muneeh, ..	90 "	..
	Utala, Ghavee, Chatara, ..			
	Pola, Kadurra, Sanang, ..			
	Doap Newal, ..			
	Bade, ..	Bhai and Adal, ..	100 "	..
Ditto, ..	Baisak, ..	Hahoo and Deesa, ..	100 "	..
Ditto, ..	Chanai, ..	Ahmed Shah, Saheb Shah, Muhhut, and Huzrut Noor, ..	200 "	..
Akhm khels,	Chundooee hills, ..	Monza, ..	150 "	..
Amazais, ..	Parahe, ..	Ghulam Mahomed, ..	50 "	..
Ditto, ..	Deegara, ..	Maddat, ..	150 "	..
Ditto, ..	Behatgalee, ..	Rahmat, ..	200 "	..
Mada khel,	Mahawara, ..	Fattoo, ..	100 "	..
Ditto, ..	Bahekar, ..	Meer Hamza, ..	100 "	..

SIRDAR FUTTEH KHAN.—(Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Mada khels,	Maira, ..	Sayud Ghulam,	200 foot.	
Ditto, ..	Sona, ..	Zain, ..	600 "	
Ditto, ..	Maza kot,	Salakhee, ..	500 "	
Hauzais, ..	Tuhara, ..	Saheddad, ..	100 "	
Ditto, ..	Maidan, ..	Mahboob and Takel, ..	200 "	
Ditto, ..	Kinara, ..	Mahboob, ..	50 "	
Ditto, ..	Khan karoon,	Hasan Ally, chief of all the Hassanzai,	400 "	
Ditto, ..	Kadar, ..	Meer Ally, ..	300 "	
Kamalzaïs,	Hoottee, ..	Ahmed and Azee khel,	100 "	
Ditto, ..	Ditto, ..	Kadeer, ..	100 "	
Namal khel,	Ditto, ..	Mouza, ..	100 "	
Mudoo khel,	Ditto, ..	Mabomed, ..	100 "	
Azee khel, ..	Ditto, ..	Fakeer, ..	100 "	
Ditto, ..	Mardan, ..	Sayad Shah, Hamza and Faizulla,	300 "	
Ditto, ..	Boghdad, ..	Jamal, ..	100 "	
Ditto, ..	Gaddar, ..	Hasan, ..	200 "	
Ditto, ..	Gujar gaddee,	Ibrahim and Rambaz,	300 "	
Ditto, ..	Fatama, ..	Nizam, ..	50 "	
Ditto, ..	Hamza khan,	Faiz, ..	400 "	
Azee khels, ..	Saidabad, ..	Abdulla, ..	400 "	
Kamalzaïs	Peerabad, ..	Avsee and Peeroo,	500 "	3,000 Rs.
Kawan khel,	Toroo, ..	Sardar Kadir, ..	200 horse,	
Boosee khel,	Ditto, ..	Omar, ..	100 foot.	
Sadee khel,	Ditto, ..	Baidulla, ..	100 "	
Amoo khel,	Ditto, ..	Lashkar, ..	100 "	
Manee khel,	Ditto, ..	Saifulla, ..	100 "	
Amar khel,	Sahamatpoor,	Lashkar and Akar,	50 "	
Sadee khel,	Ditto, ..	Sahdad, ..	60 "	
Kambar khel,	Ditto, ..	Sargand, ..	50 "	
Aka khel, ..	Ditto, ..	Durdi, ..	50 "	
	Ditto, ..	Hamza khan, ..	50 "	3,000 Rs.

SIRDAR FUTTEH KHAN.—(Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
<i>Amazais.</i>				
Ismael khel,	Garee kapoorkey,	{ Sardar Nasuroolla, Gasoo, Kadeer, Noor Mahomed Shuja- hat, Abdulla and Azeez, }	600 foot.	
Ditto,	Ghumat, ..	Muzafur, ..	100 "	
Ditto,	Kot, ..	Ashraf and Nazam, ..	100 "	
Ditto,	Doulatzai,	Haseen, ..	300 "	
Ditto,	Ditto, ..	Haseem, Shah Mahomed, Mahomed and Habeeb,	300 "	
Doulatzais,	Kot, ..	Kanal and Sunni, ..	50 "	
Ditto,	Bergadee,	Hakim, Kaboot, and Annal, ..	200 "	
Ditto,	Sarbazzgad,	Daroo Sarwar and Maitul, ..	200 "	
Ditto,	Ala dher,	Muharak and Mahomed Hussan, ..	100 "	
Ismaizais,	Bashk aly,	Julal, Sardar Mahomnad and Lushker, ..	250 "	
Ditto,	Gujar, ..	Mahomed and Ayaz, ..	100 "	
Doulatzais,	Oortya, ..	Sirdar Munsoor and Yakooob, ..	100 "	
Ditto,	Machatee,	Kalum, Ashraff, Mahomed and Buldud, ..	300 "	
Ismaizais,	Soodheree,	Hazrat Shah, Bawar Shah, ..	200 "	
Ditto,	Bazar, ..	Ashraf, ..	100 "	
Ditto,	Bareegool,	Mahomed, ..	200 "	
Ditto,	Kavtar pan,	Awayat, ..	100 "	
Ditto,	Ali dher,	Mouzum, ..	100 "	
Ditto,	Noor aly,	Oobe, ..	100 "	
Ditto,	Chair gulai,	Noor Yar and Momim, ..	200 "	
Ditto,	Hamza kot,	Meer, ..	50 "	
Ditto,	Cheena, ..	Awar, ..	100 "	
Khidrzaiz, Bara khels,	Sema, ..	Meer Shikar, Ataee, Anand, Mahomed and Raheem, ..	1000 "	3,000 Rs.
Khidrzaiz,	Tulandai,	Sardar Raham, Meer Ally and Mohammud Deen, ..	300 "	3,000 "
Ditto,	Akoova, ..	Ahmed and Zaman, ..	200 "	
Ditto,	Khaleel kilee,	Ahmed, ..	100 "	
Ditto,	Hanza dher,	Noor Shah, ..	100 "	
Aka khel,	Imaila, ..	Sirdar Lushkur khan, Ahmed Ibrahim Zafur and Sheo Jang, ..	400 "	
Ditto,	Deena, ..	Peer, Balola and Ibrahim, ..	500 "	

SIRDAR FUTTEH KHAN.—(Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Aka khel, ..	Bazar, ..	Ibrahim, ..	200 foot.	
Ditto, ..	Meer Aly, ..	Lashkar, ..	100 "	
Ditto, ..	Nai Kilee, ..	Nadir Surwar and Balo, ..	300 "	
Ditto, ..	Sota, ..	Penda, Sher Ally, ..	200 "	
Malakzais, ..	Yar Husen, ..	Arab shah, Zamin shah, Ahmed khan and Mahmood khan, ..	1000 "	3000 Rs.
Ditto, ..	Dhohyan, ..	Fatfeh, ..	200 "	
Ditto, ..	Taracheena, ..	Meer, ..	200 "	
Maneezais, ..	Khazana, ..	Sardar Zafur, Ally Sher, and Sardar, ..	400 "	
Ditto, ..	Dagai, ..	Kaheer, ..	200 "	
Ditto, ..	Narjee, ..	Futfeh, ..	200 "	
Ditto, ..	Tarkar, ..	Asad, ..	300 "	
Ditto, ..	Ispen kaneer, ..	Mahomed Ally, ..	100 "	
Mahomedzais, ..	Akooba, ..	Sardar Jahan Abdulla and Meer, ..	300 "	
Ditto, ..	Kaloo khan, ..	Sujut, ..	100 "	
Ditto, ..	Mankot, ..	Gawar, ..	100 "	
Ditto, ..	Sappoo gadee, ..	Ikram, ..	50 "	
Ditto, ..	Gulama, ..	Mohamed Deen, ..	200 "	
Ditto, ..	Baisa, ..	Deena, ..	50 "	
Ditto, ..	Sher Derra, ..	Asad, ..	150 "	
		Total horse, ..	420 "	
		Total foot, ..	28,412 "	
		Total tribute, ..		42,200 "
SWAT.				
Durrus khel, ..	Talak, ..	Mahomed khan, ..	200 foot.	
Ditto, ..	Chapryal, ..	Gafar Ghulam and Satar, ..	300 "	
Ditto, ..	Ageel, ..	Shah Azam and Timour, ..	150 "	
Ditto, ..	Lalapoor, ..	Jawahir and Ram, ..	200 "	
Ditto, ..	Sakha, ..	Shah Jyzat, Pende and Sikunder, ..	200 "	

SWAT, — (Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Durrus khel, ..	Kalakot, ..	Ghulam, ..	50 foot.	..
Mahomed khel, ..	Dewal, ..	Abdulla and Moheen, ..	250 "	..
Ditto, ..	Zerdoul, ..	Salaunt Baidulla and Noor Mahomed, ..	150 "	..
Ditto, ..	Salagram, ..	Ibrahim, ..	90 "	..
Ditto, ..	Ala dher, ..	Noorulla and Meer Hassan, ..	150 "	..
Ditto, ..	Baidarra, ..	Meer and Kamardeen, ..	250 "	..
Ditto, ..	Sanabat, ..	Mouza, ..	150 "	..
Khaja khel, ..	Guleebagh, ..	Ahmed, Yar and Ameer, ..	300 "	..
Ditto, ..	Garra, ..	Dabhosee and Shah Alam, ..	150 "	..
Samozai, ..	Bargadhee, ..	Ahmed, ..	150 "	..
Ditto, ..	Soneepoor, ..	Sagee, ..	50 "	..
Ditto, ..	Banakal, ..	Zaidulla and Arsulla, ..	150 "	..
Ditto, ..	Aboozal, ..	Peeruz and Walee, ..	200 "	..
Ditto, ..	Durust khel Bala, ..	Meer and Gulfaraz, ..	150 "	..
Ditto, ..	Ditto, ..	Zer Bazdar and Hubeeb, ..	500 "	..
Ditto, ..	Saroona, ..	Kaloo, ..	100 "	..
Ditto, ..	Saroona tatte, ..	Mahomadee, ..	100 "	..
Ditto, ..	Takoo, ..	Lal, ..	100 "	..
Ditto, ..	Takoo tale, ..	Ameen, ..	100 "	..
Ditto, ..	Nangeer, ..	Abe, ..	100 "	..
Bar Bam khels, ..	Bam khel, ..	Kastum and Shah Walee, ..	300 "	..
Ditto, ..	Noneepoor, ..	Shah and Mohamed, ..	500 "	..
Ditto, ..	Sanapat, ..	Husen and Ghulam and Ahmed, ..	500 "	..
Ditto, ..	Kharedee, ..	Kabeem Obaid and Abdulla, ..	500 "	..
Nikee khels, ..	Nikee khel, ..	Ikram, Maddat and Kachoo, ..	500 "	..
Ditto, ..	Zer, ..	Mohamed, Ninnutaz and Muharam, ..	500 "	..
Ditto, ..	Eesa khel, ..	Mahomed and Sahiaz, and Sahzada, ..	400 "	..
Ditto, ..	Khaha, ..	Asaee, Shah Mahomed, Mahomed Shah and Backat Shah, ..	500 "	..
Ditto, ..	Zer theree, ..	Ataee Mahububat and Kudrat, ..	300 "	..
Ditto, ..	Bar theree, ..	Abdulla, Myan and Kharulla, ..	400 "	..

SWAT, — (Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Nikee khels,	Salakee,	Nachama and Atee,	300	foot.
Bar Bahoozais,	Kesawar,	Nasee, Jalal and Jamal,	500	"
Ditto,	Farree,	Naseer, Sher, Mahulla, and Habeebulla,	400	"
Ditto,	Pesheen,	Nandar,	100	"
Ditto,	Banpoor,	Gazan,	100	"
Ditto,	Sagulpoor,	Saloo, Sooleman, and Shah Habeebulla,	500	"
Ditto,	Jamal,	Azeem,	100	"
Ditto,	Kukura,	Kadeer,	100	"
Ditto,	Deyra,	Mahommad,	200	"
Ditto,	Pana,	Jan Mahomed,	200	"
Ditto,	Shah Alam,	Mahboob Myan,	200	"
Ditto,	Bar dher,	Najeib,	100	"
Soluzais,	Munara,	Fazulla,	200	"
Ditto,	Gala,	Abdulla,	100	"
Ditto,	Barrekot,	Abdulla-Raheemalla and Kama,	400	"
Ditto,	Abooa,	Raheem, Hazrat and Khilat,	500	"
Ditto,	Kot gram,	Mazulla and Ibrahim,	400	"
Ditto,	Hodbee,	Sarool, Kareemulla, Raheem and Hussan,	400	"
Ditto,	Balgeeram,	Najeib, Hussun, and Izzut,	400	"
Ditto,	Sakara,	Noor and Abeed,	300	"
Baizais,	Bakhta,	Myan and Ahmed,	400	"
Ditto,	Thana,	Kabil, Nasee Khamilla, and Abdulla,	700	"
Ditto,	Bazdarra,	Yar, Malak, Meer, and Sargand,	300	"
Ditto,	Kotal,	Mahulla and Khoj,	200	"
Ditto,	Lund Khlood,	Mosam, Naseem, and Zaidoo,	500	"
Kanazais,	Lotakan,	Abdoo and Mohamed Deen,	200	"
Ditto,	Maikan,	Adam and Raheem,	200	"
Ditto,	Jola,	Karam and Najeem,	200	"
Ditto,	Dheree,	Benares Setah and Azoom,	400	"
Ditto,	Barangola,	Kudrat, Myan, and Myan and Nasurulla,	300	"

SWAT, — (Continued.)

Name of Clan, (Tuppay.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Ranazai, ..	Barangola, ..	Sayad Myan, ..	100 foot.	..
Ditto, ..	Badawan, ..	Khairoo and Nasam, ..	200 "	..
Ditto, ..	Khar, ..	Zaidulla, Mayat, Mohtum and Ataee, ..	600 "	..
Ditto, ..	Ditto, ..	Nai killee, Shah Noor, ..	100 "	..
Ditto, ..	Bhat khel, ..	Baidulla, Uurz, and Raheem, ..	400 "	..
Ditto, ..	Alaud, ..	Jawaz, Omer and Raheem, ..	500 "	..
Ditto, ..	Shahkot, ..	Kustam and Bahadur, ..	200 "	..
Ditto, ..	Dargahee, ..	Khairulla, ..	200 "	..
Ditto, ..	Kharkahee, ..	Jaman and Kareem-ulla, ..	100 "	..
Ditto, ..	Garee, ..	Mahomed Shah, ..	200 "	..
			Total horse, ..	0
			Total foot, ..	19,890 "
			Total tribute, ..	0
VALLEY OF CHAMLA.				
Mahomed khel, ..	Amahela, ..	Mahomed, Abdulla and Baghee, ..	200 foot.	..
Ditto, ..	Nakaree, ..	Sangdar, Bazdar and Mubhoob, ..	250 "	..
Mahomedzais, ..	Sorag, ..	Kaim and Kazim, ..	200 "	..
Ditto, ..	Nawayar, ..	Zaidulla, Norr and Mouzam, ..	200 "	..
Ditto, ..	Kolee, ..	Nawaz and Ibrahim, ..	150 "	..
Ditto, ..	Kot, ..	Bahadur Abdulla, ..	200 "	..
Ditto, ..	Makhadeen, ..	Mahomed and Eesoo, ..	200 "	..
Khudoo khels, ..	Bhoos Dierce, ..	Mahomed and Gadoo, ..	200 "	..
Ditto, ..	Charodee, ..	Ootman, Ahmed and Raheem, ..	200 "	..
			Total horse, ..	0
			Total foot, ..	18000 "
			Total tribute, ..	0

VALLEU OF BUNHER.

Name of Clan, (Tuppai.)	Name of Village.	Name of Chief, (Malik.)	Number of match-lock men.	Amount of annual tribute paid to the Sikhs.
Barakazais,	Bayra, ..	Kabeer khan and Ameer Baz,	350 foot.	
Ditto,	Koleearee,	Meer Shikar and Anund,	400 "	
Ditto,	Matanai,	Sakur, Soola, and Maddat,	500 "	
Ditto,	Banshatta,	Karam Shah and Naromo,	400 "	
Ditto,	Kalpanee,	Sugud Meer and Nathoo and Najam,	700 "	
Moorzais,	Gagra, ..	Lashkar, Noor and Naeem,	200 "	
Goryan khel,	Agrai, ..	Fakeer, Noor and Naeem,	600 "	
Ditto,	Konga, ..	Bahodur and Shabdad,	400 "	
Ditto,	Soomegram,	Sher, and Pajah,	300 "	
Ditto,	Kayan, ..	Shahar, and Hassan,	250 "	
Esezaiz,	Torsak, ..	Hussan, Husanally, Nujoo and Deleb,	800 "	
Ditto,	Anyapoor,	Mukarab and Mahomed,	500 "	
Ditto,	Itai, ..	Mahomed Shah, Soobeh, and Karam Dad,	500 "	
Khel Imszaiz,	Sulbandee,	Kale, Arab, Juhangeer dad, ..	700 "	
Ditto,	Ananapoor,	Ibrahim and Meera, ..	500 "	
Ditto,	Dayram Japaees,	Sarwar and Sahamal, ..	500 "	
Ditto,	Dheree, ..	Sahamdar, Kaheer and Jahangeer, ..	400 "	
Ditto,	Kata kot,	Mahomed and Azeez, ..	300 "	
Ditto,	Bhoos Dhera, ..	Meer Baz,	200 "	
Ditto,	Takhtia Baud, ..	Saydad, Myan Syados and Kutub Shah, ..	"	
Total horse,			0	
Total foot,			8450	
Total tribute,			0	
Grand Total,			Horse 420	Rs. 42,200
			Foot 50,947	

Report of a Trial for Rebellion, held at Moulmein by the Commissioner of Tenasserim. Communicated by the Sudder Dewanny Adawlut. With a plate.

GOVERNMENT

versus.

NAG PAYN AND 20 OTHERS.

Charge—Rebellion attended with Murder.

This trial came on before the commissioner of the Tenasserim Provinces at the sessions for the month of February 1844.

The prisoners pleaded not guilty to the following charge :

1. Nga Pyan, Prisoner.

CHARGE.

1st. In having, during the month of May 1843, unlawfully assembled men for purposes treasonable to the state, and subversive of the public tranquillity.

2ndly. In having, on the 15th of the same month, unlawfully resisted with arms the officers of the Government, thereby causing bloodshed.

3rdly. In having been concerned as accessory in the wilful murder of Nga Kaloo, on the 15th May 1843.

PRISONERS.

- | | |
|--------------------|--------------------|
| 1. Nga Shoay Loo, | 11. Nga Shoay Koo, |
| 2. Nga Shoay Moun, | 12. Nga Wey, |
| 3. Nga Dot, | 13. Nga Oung Meng, |
| 4. Nga Shoay Pho, | 14. Nga Dok, |
| 5. Nga Yee, | 15. Nga Mhwe, |
| 6. Nga Pathee, | 16. Nga Shoay Too, |
| 7. Nga Daray, | 17. Nga Shoay Go, |
| 8. Nga Pok, | 28. Nga Kyee, |
| 9. Nga Han, | 19. Nga KyauGoung, |
| 10. Nga Nyai, | 20. Nga Mhe. |

CHARGE.

1st. For having, during May 1843, unlawfully joined Nga Pyan for purposes treasonable to the state, and subversive of the public tranquillity.

1844.
July 19.

Case of Nga Pyan and 20 others.

In a trial for rebellion in the Tenasserim Provinces, in which one life was lost, the Court, at the recommendation of the commissioner, who although he had recorded a sentence of death against him, proposed a mitigation of the punishment, sentenced the ringleader to imprisonment for life in the local jail, as a better warning to others than imprisonment with labor and irons, varying according to their several degrees of guilt.

1844.
July 19.

Case of NGA
PYAN and 20
others.

2ndly. In having, on the 15th of the same month, unlawfully resisted with arms the officers of Government, thereby causing bloodshed.

3rdly. For having been concerned as accessories in the wilful murder of Nga Kaloo on the 15th of May 1843.

The origin and scene of the disturbances for which the prisoners were tried, were thus described in the letter of reference accompanying the proceedings.

“The insurrectionary movement which gave rise to the trial, was discovered in May 1843, very suddenly, and just at the moment of the intended outbreak. At first, every person denied knowledge of the affair; but enquiry soon showed that it was well known to the Buddhist population of every rank, and that the leader, Nga Pyan, had long been becoming famous for sanctity, which, in these countries, is a necessary introduction to political power, for there is no priesthood in our sense of the word. Those whom we call priests are monks bound by temporary vows, seeking knowledge or their own individual subsistence. The civil magistrate is the real priest, being at the head of the nation taken as a religious as well as a civil community;—thence every Buddhist dynasty has been founded by religious fanatics, or impostors, having military talent,—and the reigning families always claim special powers from heaven. Religious ascetics and fanatics are therefore jealously watched, and put down with a strong hand when their followers become numerous, especially at the periods marked in their prophecies, or, in popular belief, as those in which great changes may be looked for. Such a period is the present, as will be seen from the proceedings.

“The time chosen was judicious—he was to meet his followers from all parts of the country at Gyne, two days’ journey from this, thence he was to come down to the White Pagoda, close to Moulmein, and declare against the English. This was to happen at the begin-

ning of the rains when the country becomes impassable for troops, and he would have been master of the upper country during the rains—which would have produced a great effect on the people both here and in the Burmese territory, where also the people were much excited.

“Captain McLeod, my principal assistant, was despatched at once with a party of the local corps to Daloung, near the Siamese frontier, where Nga Pyan was; and the civil charge (revenue excepted) of that part of the country was also temporarily given him; at the same time the local native officers of districts and villages were called on to arm a portion of the inhabitants, there being reason to suspect most of them of being implicated. The suspicions were made known, with a promise of no further enquiry in case of zeal.

“Forced marches brought Captain McLeod up just in time to meet Nga Pyan as he was leaving the Pagoda, where he had performed the ascetic devotions required, according to popular belief, in founders of dynasties. He was proceeding to Gyne, where the people were at that moment assembling from all parts with arms. The trial details the proceedings—a party under the native magistrate of the district (Moung Gyaing, the Goung Gy-ouk) ordered Nga Pyan and his people, who were in canoes, to stop and give themselves up, but they refused, and a skirmish followed, in which a few of Nga Pyan’s people were killed or wounded, and one man of the Government party was slain. Nga Pyan fled, but by great energy and zeal, and conciliation on the part of Captain McLeod, the Karens, who inhabit those districts and had all joined Nga Pyan, were led to confide in a promise of perfect amnesty if they prevented the flight of the insurgent party—very large rewards were at the same time offered, as far as rupees 1000, for Nga Pyan himself, and eventually nearly all the leaders were secured. At the same time the native servants of Government were assured of forgiveness.

1841.
July 19.

Case of NGA
PYAN and 20
others.

1844.
July 19.

Case of NGA
PYAN and 20
others.

“In pursuance of these promises the inquiries, at least those judicially made, have been limited to what sufficed for the conviction of the prisoners. It will be seen that Nga Pyan first gained influence by works of religious merit; that he raised funds enough to build a number of Pagodas, and that during the prevalence of the cholera, people flocked to him for safety, trusting to his miraculous powers. Over the place where he sat at the White Pagoda, was hung one of the Burmese religious paintings setting forth his religious visions, and the superior beings indicating to him the site and the form of the Pagodas he was to build. This painting accompanies the proceedings, (*See Plate.*) The Pagodas are actually similar to those represented, save the gilding, which is not completed; but a great number of others, of smaller size, were built or begun all around them, by subscription of persons who had become Nga Pyan's disciples. It is the custom to fill the centre of them with images of Godama, bearing the name of the donor, and it was the names on these which enabled me first to obtain a good clue to the affair—a few of these, out of many hundreds, are also forwarded.

“The proceedings show how all this was directed beyond mere superstition. The people were by the reading and expounding of prophecies, led to look for the revival of a national dynasty of this country (Pegu) in the Burmese year 1206, the present year—and the future ruler was to be the person who should put the *zee*, or umbrella-shaped ornament on the new Pagodas—for the ordinary magistrate was not to do this. On the time approaching, it will be seen, Nga Pyan retired to Daloung with a few of his own devoted followers, to practise the austerities usual in such cases,—he seized the traders moving through the country, and made them swear allegiance, and before proceeding to the rendezvous at Gync, learning that a part of the local corps was despatched against him, he issued the proclamations

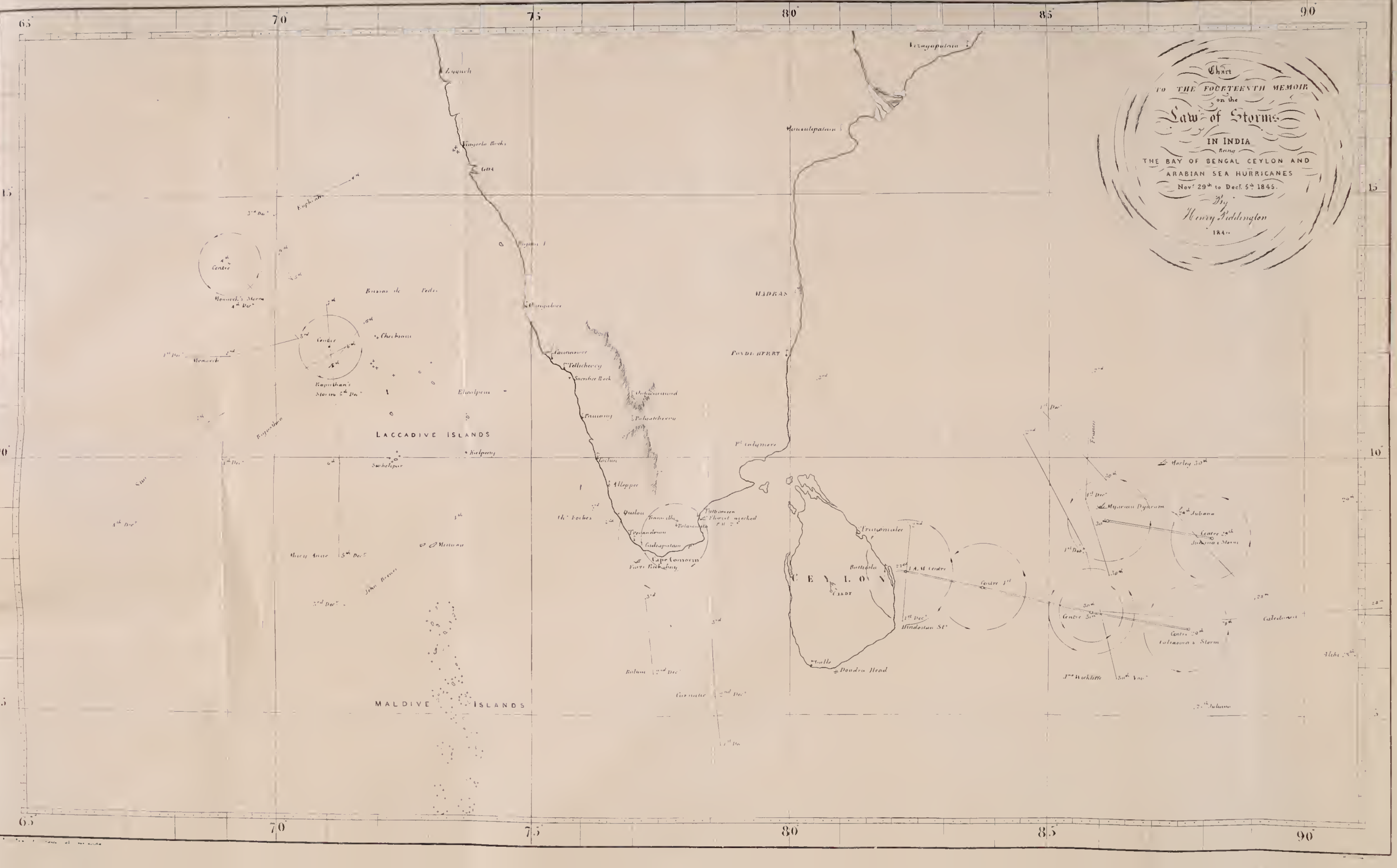


Chart
TO THE FOURTEENTH MEMOIR
on the
Law of Storms
IN INDIA
THE BAY OF BENGAL CEYLON AND
ARABIAN SEA HURRICANES
Nov. 29th to Dec. 5th 1845.
By
Henry Piddington
1845

given in the proceedings, calling on them to give up their arms and join him. These proclamations* are in the form used only by the King of Ava, and never by a subject. He also assumed in all respects the titles of royalty, and set up the black flag which in these coun-

1841.
July 19.

Case of NGA
PYAN and 20
others.

* TRANSLATION No. 1.

If your soldiers, knowing that (this) victory-flag-order has been placed, Friday, the 13th of the waxing of Kah-zong, 1206 (a) (May 11th 1843,) still presume to make forcible entrance, I, the golden personage, am possessed of the golden tsah-kyah bow, the gift of the celestial king, and I am possessed also of the tsah-kyah sword.

According to the ancient custom of dynasty-founders, sovereigns only ought to engage in combat. You (the inferior pronoun, equivalent to *you fellows*) and I (the superior pronoun, equivalent to *Lord I*) are not on a par, in point of glory and destiny. If I hind my golden tsah-kyah bow, I fear that death and destruction will come upon (many) creatures, and therefore I place (this) victory-flag-order.

A royal order from the sovereign lord of *Da-mu-tsah-kyah*.

TRANSLATION No. 2.

The sovereign of the four grand continents, the most glorious lord of the tsad-dan, white elephant, master of the aring-da-mah tsah-kyah spear, owner of the ma-nan-ma-yah gem, radiant in benevolence and power, (as) effulgence bursting from the summit of Myenmo,—power to reign over the four continents—issues a royal order:

Ho! all ye soldiers, who come marching from afar unto the victory flag, which I have set, Friday, the 13th of the waxing of Kah-zong, 1206, (May 11th 1843)! That I may easily ascertain, whether you will deliver up your lives, and become my own servants or not; ye are to come by ones and twos, and lay down your arms and do me homage.

A royal order from Lord *Da-mu-tsah-kyah*. (b)

When the oath was administered by Nga Pyan, the royal words were thus recited :—The most excellent master of land and sea, lord of the tsah-dan, white elephant, master of the tsah-kyah weapon, *Da-nu-ra-jah-men* (king *Da-nu*) declares, that, whereas our subjects, the common people, are now in a poor and suffering state; the towns and villages shall, under my reign, be so taken care of, that they (the common people) shall be quiet and happy. Which being read, the oath was administered.

Testimony given before the magistrate.

Moung Tan-Laye.

(A true translation,)

(Signed) A. JUDSON.

(a) Evidently anachronistic.

(b) *Da-mu* is Pali, and signifies *bow*. In the first order, he is styled Lord of the tsah-kyah bow—and in the second, Lord tsah-kyah bow.

1844.
July 19.

Case of NGA
PYAN and 20
others.

tries is understood to indicate a resolution to subvert the Government *de facto*. It is as proverbial in this sense here as to indicate pirates among European nations.

The prisoner No. 10, Nga Han, being sick was not tried; and No. 11, Nga Nyaik was acquitted. The prisoners No. 8, Nga Dairay, and No. 15, Nga Dok, were convicted on the 1st count, and acquitted on the 2d, and sentenced by the commissioner, Major Broadfoot, to be imprisoned for seven years from the 1st June 1844; no mention was made of the 3d count. The commissioner convicted all the other prisoners, and recorded against them a sentence of death; but, in his letter of reference, he recommended the following remissions of the extreme penalty of the law.

To the prisoner No. 1, Nga Pyan, as the ringleader, he said he had held out no hope of any commutation of the sentence. Had no life been lost, he should have recommended that even this person should be sentenced merely to imprisonment for life; but, as arms were resorted to, he refrained from recommending any mitigation, leaving the matter entirely in the hands of the Court. In the 17th* paragraph of his letter however, he evidently leaned to the opinion, that justice would be satisfied, and that policy required a commutation of a sentence of death to one of imprisonment for life.

The prisoners Nga Shoay Loo, No. 2, and Nga Shoay Koo, No. 12, as influential and dangerous persons, not

* 17th Para—"I beg further to recommend that the sentences date from the 1st of July 1843, by which time all were apprehended—and finally I subjoin the reasons referred to above for having, in a case of offence so serious, and so nearly producing very calamitous results, recommended punishment so lenient.

"1st.—The superstitious and national feelings of the people were strongly appealed to; and leniency lessens the chance of the criminals being looked on as martyrs; indeed, in this case, will destroy it. I believe if Nga Pyan be imprisoned for life, and the others punished as above recommended, the general feeling will be that mercy has been extreme, which is always the safer where the Government is concerned.

instigated by superstition as the others, but by the desire of exciting a disturbance, with a view to profit by it; and as having been in Nga Pyan's confidence, he proposed to sentence to imprisonment with labor for 14 years.

1844
July 19.

Case of NGA
PYAN and 20
others.

The next in activity, No. 3, Nga Shoay MOUNG, No. 16, Nga Mhwe, No. 18, Nga Shoay Go, and No. 19, Nga Kyce, he proposed should be sentenced to imprisonment for 10 years with labor,—unless the Court should think the fact of Nos. 18 and 19 being brothers of Nga Pyan, and men above the average incapacity and resolution, required a longer period of imprisonment.

The rest (with the exception of Nos. 13 and 21, whom he proposed to imprison for two years each,) he recommended should be imprisoned for five years with labor, viz. Nos. 4, 5, 6, 7, 9, 14, 17 and 20.

Why the commissioner sentenced Nos. 8 and 15, who were convicted on only the 1st count, to seven years, while he proposed to sentence those mentioned above to five and two years, was not apparent.

The case in the Nizamut Adawlut was laid before Mr. Reid, who, under all the circumstances of the case, concurred with the commissioner in convicting the prisoners as above recorded. For the reasons stated in the 17th paragraph of the commissioner's letter, he did not think it would be expedient to sentence the prisoner Nga Pyan to suffer death, and accordingly sentenced him to be imprisoned for life. Transportation beyond seas was not added, because imprisonment among those whom he attempted to seduce from their allegiance was deemed a more proper punishment. The prisoners Nga Shoay Loo, No. 2, and Nga Shoay Koo, No. 12, were sentenced to imprisonment with labor in irons for fourteen (14) years; Nga Shoay MOUNG, No. 3, Nga Mhwe, No. 16, Nga Shoay Go, No. 18, and Nga Kyce, No. 19, to imprisonment with labor in irons for ten (10) years; and the prisoners Nga Dot, No. 4, Nga Shoay Pho, No. 5,

1844.
July 19.

Case of NGA
PYAN and 20
others.

Nga Yee, No. 6, Nga Pathee, No. 7, Nga Pok, No. 9, Nga Oung Meng, No. 14, Nga Shoay Too, No. 17, and Nag Kyan Goung, No. 20, to the same for five (5) years. The sentence of seven (7) years' imprisonment passed by the commissioner on Nga Daray, No. 8, and Nga Dok, No. 15, was annulled, and they were sentenced each to be imprisoned, with labor in irons, for five (5) years. Nga Wey, No. 13, and Nga Mhe, No. 21, were sentenced to be imprisoned, with labor in irons, for two (2) years. The sentences of temporary imprisonment were ordered to commence, as recommended by the commissioner, from the 1st July 1843.

In regard to the prisoner Nga Han, No. 10, whose trial was not completed in consequence of his sickness, the commissioner was directed to use his discretion, and either conclude the trial against him, or hold him to bail for his future good conduct.

NOTE.—The banner represented in the accompanying lithograph has been copied with care from the original, deposited by the sanction of the Sudder Judges in the Society's Museum.—Eps.

Memorandum on the Iron Works of Beerbloom. By WELBY JACKSON, Esq., C. S. forwarded with specimens for the Museum of Economic Geology.

SIR,—I send with this letter several specimens of the iron ore of Zillah Beerbloom; which it may perhaps be worth while to examine, in order to ascertain its value, and the nature and proportion of its ingredients.

This ore is now worked in the vicinity of Seory in Beerbloom; but the manner of working and smelting it is so rude, that I have little doubt much of the iron is left in the refuse; if railways are established, the demand for the iron of Beerbloom may be greatly in-

creased, more particularly as the ore is found at no very great distance from two of the most probable lines of railway, those between Calcutta and Rajmahal, and between Calcutta and Benares or Mirzapore.

The soil of the whole of the vicinity of Seory consists of ironstone, but the work is chiefly carried on at Deocha, which is marked in Rennell; also at Bharcata, Damra and Goonpore; it is found in these places, and is also brought from Sibperbaree, and other places in the Pergunnah Mullarpore; all to the north, a little east of Seory, the Sudder Station of Zillah Beerbhoom.

The ore is I believe argillaceous iron ore;* no flux is used in smelting it, which is done entirely with wood charcoal; a manner of working which may have a good effect on the produce, which is said to be of good quality; but it must be very expensive, and the progress of the work is gradually destroying the fuel in the vicinity; it is smelted twice in circular kilns, the ore being taken out in a mass from the bottom. I send specimens of the iron after the first, and after the second smelting, also of the refuse of each burning; each smelting occupies four days and nights; and I am informed, produces 25 mds. of iron, at a cost of 17 rupees from each kiln; there are about 30 kilns, each of which pays one rupee for each smelting to the farmer of the Loha Muhal, who claims a monopoly of the iron manufacture; the iron thus produced, is sold for 1 rupee a maund to the refiners, who again pay six pie per maund to the monopolist. I understand the iron produced is of very good quality.

It is common, I believe, to find limestone and coal in the vicinity of iron ore of this description: no limestone has yet been found in Zillah Beerbhoom, but the country has not been well examined; coal is found in abundance near the river Dumoodar, about seventy miles off; the want of limestone, the usual flux, is a serious difficulty, and it would be worth while to examine the country to the north of Seory, as far as the foot of the range of hills which runs out from the Ganges at Rajmahal towards Deogurh, perhaps coal might be found

* It is rather an argillaceous iron-ore matrix, with brown hæmatite and small, semi-crystallised nodules of magnetic iron-ore; called, according to the labels, *Beej pathur* (seed stones,) and from these last the iron is said to be made; but the mixture of the hæmatite and the magnetic ore would give very fine iron.—CUR. MUS. ECON. GEOLOGY.

nearer the place where the works are now carried on; the only lime procurable is made from the common kunkur.

The circumstance of a monopoly of the iron manufacture existing in Zillah Beerbhoom is curious; I spoke to the agent of the monopolist on the subject; it seems he claims and exercises the monopoly throughout what was formerly the Zemindaree of the Rajah of Beerbhoom, which is by far the greater portion of the whole Zillah; the Rajah no longer holds the Zemindaree, which has been divided and sold; the monopoly is said to have been purchased at a revenue sale, and to have been acknowledged by a decision of the Sudder Court. I was enquiring more carefully into this subject, but was obliged suddenly to leave the district; I am much inclined to doubt the right claimed, but have not yet seen the documents on which it is grounded. I cannot conceive how such a right can have originated.

WELBY JACKSON.

Account of certain Agate Splinters found in the clay stratum bordering the river Narbudda, with specimens accompanying. By Capt. J. ABBOTT, late Assistant in Nimaour.

MY DEAR SIR.—May I claim the favor of your attention to a singular phenomenon exhibited by the clay and kunkur strata, bordering the river Narbudda.

2 The valley of this river in Nimaour is a basin of black trap rock, perforated occasionally by peaks of granite. Upon the trap, is usually found a bed of clay twenty feet in depth, rendered barren by an admixture of sand and lime. Upon this bed is imposed black or an iron-brown soil, from half a foot to three feet in depth, composed almost exclusively of the debris of decayed, and the charcoal of burnt vegetation. Masses of trap (occasionally basaltic) break through these strata, and large hollow nodules of quartz filled with white or with amethystine crystals are found scattered over the surface; but more commonly in those portions of the valley which owing to superior height or other peculiarities, have no covering of clay nor of vegetable soil.

3. Along the Narbudda's brink, the black soil has been generally abraded by the torrents, leaving barren ravines of clay and kunkur,

the section of which is yearly exposed as the surface crumbles. The kunkur in this bed is scattered through the thickness of the soil, with little visible stratification; existing there in small drops of the size of pocket-pistol bullets, which being found collected in the rocky beds of torrents, are used as gravel for garden walks.

4. As the cliffs of clay aforesaid crumble away, fragments of agate, milk-white, pellucid or streaked, are brought to light, sown equally through their substance; not as complete pebbles occasionally fractured or chipped, but universally as fragments, such as might be shivered from pebbles placed between an anvil and a sledge-hammer; about half of the specimens which I happen to have preserved, accompany this letter. They are faithful samples of the general appearance of this mineral in the clay stratum. It will be observed that the surface is always uncorroded, so that they must have been shivered in their present position as parts of a clay-bed twenty feet in depth; or more probably, immediately previous to their present location: for, all agates acquire a milky crust by long exposure to the action of the elements. They are found in abundance at the foot of all the clay cliffs, and may be picked out of the strata on ascending. I have seldom if ever found a complete series of fragments constituting a pebble: whence I would argue, that they were shattered previous to being involved in the clay. They are the only stones,* occurring in this bed, and I have never found one of them unshattered, although there are abundance such in the river bed close by, and the trap rock is full of perfect agate pebbles.

5. You will observe how violent and decided must have been the concussion, to shiver so hard a stone into splinters so sharp and slender; an application of force, known in Nature at present only at the foot of water-falls having a shallow basin, or upon any rocky ledge at the base of a volcano. Were the fragments found in such a position, the projection upon their original masses of other rocks, might have sufficed to strike them off; but the clay matrix in which they are involved, would have preserved agates unshattered beneath the fall of mountains.

* The river channel contains agates, rolled masses of jasper, porphyry, sandstone and limestone. The soil around has few stones excepting boulders of trap and nodules of white quartz.

6. As we believe the trap to be less ancient than the granite beneath it, so we naturally conclude the clay stratum to be less ancient than the trap upon which it rests, and which otherwise must have submerged it. The agate pebbles seem evidently to belong to the trap formation, in the solid substance of which they prevail in such numbers as occasionally to give it the appearance of pudding stone. The convulsion which shattered the agates under consideration must have happened after the deposit of the trap strata, but I think previous to the deposit of the clay bed, the first soil sprinkled over the rocky surface. Whilst the valley was still a basin of naked trap, the fall or rolling together of rocks might shatter even the solid substance of agate. But this effect could be produced under water, only I think at the foot of water-falls. And, that every agate of a stratum, twenty feet in depth and many miles in area, should have been subjected to this action, seems improbable. The very clay itself belongs not to the formation upon which it rests; but has been wafted hither from mountains probably hundreds of miles distant, and thus mixed up with the agates, by some deluge of a very extensive character. And the appearance of these splinters of agate might lead conjecture to regard the primitive soils of our earth, as ground from the living rock, rather by some brief but most violent convulsion of the elements, than by the gradual and equable action of an ocean, in a succession of ages.

7. With such speculations all Geologists are familiar; yet every fresh illustration seems worthy of attention; and it is perhaps seldom that we have so clear an evidence of the action of secondary forces in an interval so remote as that separating the formation of the trap layers from the era of the clay deposit.

J. ABBOTT.

4, *Ballard's Buildings*, 1st Sept. 1845.

Notes, chiefly Geological, across Southern India from Pondicherry, Lat. N. 11° 56', to Belloor, in Lat. N. 11° 12', through the great Gap of Palghat. By CAPTAIN NEWBOLD, F.R.S., M.N.I., Assistant Commissioner, Kurnool. No. III., with a plate.

At Pondicherry, the soil on the surface is sandy; but the subsoil consists of a blackish stiff clay imbedding existing pelagic shells. A well lately dug near the factory of M. Buirette, exhibits the layers according to the diagram below.

Immediately to the west of the city the land gently rises into the low eminences called the Red Hills, which are intersected by numerous small ravines; and rugged with inequalities of surface.

In the valley and rising ground between them and the village of Trivacary, about sixteen miles westerly from Pondicherry, are the Neocomian beds of limestone, and near Trivacary itself, the celebrated fossil wood deposit which has been described elsewhere. The principal shell limestone localities are in the vicinity of the villages of Sydapett, Carassoo, Coolypett and Vurdavoor.

Trivacary.—At Trivacary the granite and hornblende schist are again seen, and also at Belloor, or Vellapur, the kusbah of a taluk of this name in South Arcot, twenty-four miles westerly from Pondicherry. These rocks are penetrated by trap; and on them rest in little disturbed stratification, the Neocomian limestone beds, which support, like the nummulitic limestone of Egypt, beds of loose sandstone entombing the large silicified trunks of both dicotyledonous and monocotyledonous trees, the former being by far the most abundant both in the Egyptian Desert, and likewise at Trivacary. In both cases no beds of soil in which the trees formerly grew, no Dirt bed, as in the Portland fossil forest, in which the roots and stems stand erect as they grow, could be traced; nothing but the bare calcareous beds of the ancient cretaceous and nummuliferous oceans in which they were severally deposited.

Belloor.—The face of the country between Trivacary and Belloor is rough, with ravines and water courses; with surface blocks and bosses of granite and hornblende schists. These rocks are covered in one or two localities by patches of laterite, and support a sandy soil; which, in the vicinity of Belloor, assumes the character of a tolerably fertile loam, producing *Indigo, Rice, Tobacco, Raggi, Bajra, Culti, &c.*

A bed of red clay, coarse sand, or the gravelly detritus of the subjacent rock, often form a subsoil of considerable thickness. Water is found at depths of from twelve to fourteen feet, and of excellent quality; efflorescences either of common salt, or carbonate of soda on the surface soils are rare.

The town appears populous and thriving, and contains about 500 houses, inhabited principally by cloth merchants, and cultivators (Kongyes). Near it lie the ruins of an old Jain temple. Two of its mutilated images stand at the Traveller's bungalow gateway, with their faces turned towards the pillars.

Large equestrian statues of *Ayanar*, constructed of brick and chunam, are scattered about this and other portions of the ancient Hindoo kingdom of Dravida, in the country of the Tamuls. I do not recollect seeing these statues in my travels through the ancient regions of *Andhra*, *Karnata*, or *Maharashtra*, whose boundaries are even to the present day marked by their vernacular languages, viz. Telinghi, Canarese and Mahratta.

These statues are not frequently colossal, and generally stand in the open air near pagodas or in sacred groves.

Wulundoorpet.—This village lies about twenty-nine and a half miles SW. from Belpoor. The aspect of the surrounding country is almost unbroken by elevations, covered with a sandy soil, and angular quartz gravel, through which the subjacent rock, viz. hornblende schist, and gneiss, occasionally jut out in almost vertical laminæ, with a general direction towards the SW., and the dip towards the SE. The gneiss is often curiously contorted, and passes by weathering into a loose micaceous grit, which being washed away, leaves gaps in the continuation of its bed. The gneiss alternates with the hornblende schists, which often appears in thin layers conforming to the general direction and dip of the strata.

These rocks are penetrated by veins of a porphyritic granite, consisting principally, like that at Permacoil, of reddish felspar, with adularia, and but little mica. The last mineral and hornblende in foliated crystals are seen aggregated in nests in the gneiss with pyrites; and chlorite appears as a dull green earth in cavities; sometimes these minerals are entirely wanting. The conditions under which they as well as other minerals are subject to this state of segregation, and

again of equable diffusion throughout the entire mass of rock, are matter of interesting enquiry. It is a well known fact, that heat under fusion will contribute to the concentration of particles of copper ore diffused through a matrix, and it seems probable these effects in the hypogene rocks have been produced during their subjection to metamorphic heat and crystallization.

Foliated garnet and reddish felspar occur in the more quartzzy parts of the gneiss.

In the steps of a large well in front of the Traveller's bungalow, are a few blocks of a gritty sandstone, resembling the more consolidated portions of the loose sandstone imbedding silicified wood at Trivicary. It was marked with brick red, and ochre yellow, having bands. It is said to have been quarried about two miles off, and also to occur near Verdachelum. This led me to infer the possibility of the extension of the fossiliferous beds of Pondicherry in this direction, an inference subsequently verified by Mr. Kaye, of the Madras civil service, (Vide Madras Journal for June 1844.)

The limestone in which the Verdachelum fossils are imbedded, resembles more that of the Trichinopoly beds, and the pelagic shells it contains are supposed to be of a rather more recent epoch than the Neocomien, or lower cretaceous series of Pondicherry, but this is a point not yet quite settled by the present talented Secretary of the Geological Society, Professor Forbes. The limestone was found to be associated with beds of an overlying sandstone, imbedding silicified wood, precisely resembling that of Trivicary and Pondicherry. These beds, I have little doubt were once continuous.

It is a point of much importance to ascertain the fact of the limestone beds being continuous or not, or whether the Pondicherry beds occupy a lower place in the order of superposition than those of Verdachelum and Trichinopoly. The Verdachelum beds lie between Paroor, a village about seven miles WNW. from Verdachelum and the town of Verdachelum itself, which lies about twelve miles S. by E. from Wallundoorpett. If the account given me by the natives be true, the sandstone beds extend to within two miles of Wallundoorpett. The boiling point of water gives the plain at Wallundoorpett but little elevation, if any, above the surface of the sea.

A lunar halo occurred here, the radius of which I found to measure $21^{\circ} 30'$, sky hazy, slight sensible depression of the thermometer 2° .

The superstratum of soil is sandy, frequently entirely composed of sand, some of which has doubtless been washed from, or forms part of the sandstone and silicified wood beds. In other parts a rich greyish clayey loam, mixed with a portion of lime, occurs, yielding fine crops. Staple articles of cultivation are similar to those of the last village. Kunker is occasionally met with in surface nodules, and as a substratum. The water is sometimes brackish here.

Wallundoorpett was once a place of some note under a Poligar, but now dwindled into insignificance. A sulphuriferous earth is said by natives to exist in the Wodiapolium jungle near Womaloor, a few miles south of this, occurring in the bed of a swamp, about half a mile in extent. Specimens were sent me by Mr. Fischer of Salem. The soil is of a greyish colour, friable, and the sulphur occurs in small crystals and impure nodules distributed through the soil.

Chinna Salem.—The country between this and Wallundoorpett is an undulating plain. On approaching Chinna Salem, which is about twenty-six and a half miles W. from Wallundoorpett, and fifty-five miles direct distance from the coast at Cuddalore, a chain of lofty hills with undulating ridge, broken in one or two places, is seen to the NNE. coming down from the N. apparently about ten or twelve miles distant, but ending or turning abruptly towards the W. These hills are the southern extremity of the Subghautine chain, called the Jeddy or Javidie, which flanks the eastern side of the Amloor valley.

Régur, or black cotton soil, I first observed covering the plain between Chinna Salem and Wallundoorpett, immediately to the W. of the Traveller's bungalow at Congrypollum, after crossing the rivulet which flows from the Jeddy hills by Verdachelum to the Vellaur or Porto Novo river. It is much mingled with the sandy alluvial local soil, with which it covers the surface in alternate stripes. The shrub which is almost peculiar to Régur, viz. the *Jatropha glandulifera*, is seen in great strength; and also the interlacing fibrous roots of the nutgrass. Crops of cotton now begin to appear. Beds of kunker are seen in ravines and stream banks, and sometimes occurring in higher situations, in the form of small mammillary mounds, which appear to have concreted around the mouths of springs now choked up.

In the plain, hornblende schist is the most prevalent rock. Gneiss, often granitoidal, alternates with it, still penetrated by the porphyritic veins previously described. The layers of gneiss are seen in some

*

localities running round spheroidal masses in its substance, which do not partake of the laminal structure, and have just the appearance of knots in layers of wood. These spheroids when broken have the structure and composition of true granitic, and were probably boulders, or fragments of granite, embedded in the gneiss prior to its passing into the metamorphic state, when it was first formed as an aqueous deposit; a few dykes of basaltic greenstone now rear their black crests above the surface.

Chinna Salem is a large village in the South Arcot district, near its boundary on the West by Salem. The inhabitants are mostly engaged in agriculture and the weaving of cotton cloths. It was formerly under a Poligar, whose descendants are still in existence. Some of the wells are brackish.

Ahtoor.—The Arcot frontier is crossed into the Salem district, between the villages of Royapanoor and Nuttakara (about six miles westerly from Chinna Salem), to Ahtoor, which is about twenty-one miles distant.

Around Ahtoor gneiss is prevalent, penetrated by granitic veins, and also by dykes of basaltic greenstone; one of which crosses the bed of the river in a SSW. direction. The hornblende of the gneiss is often replaced by the magnetic oxide of iron in thin regular layers, alternating with the felspar and quartz of the gneiss. It also occurs in beautiful octahedral crystals with polarity. The exterior planes of the crystals have often a bright silvery appearance from lamella of mica. Their specific gravity is estimated so high as $5^{\circ} 13'$ at a temperature of 60° . The ore is also found in steel-coloured grains, and nests disseminated in the more quartz beds of gneiss. This is the rich iron ore employed in the smelting establishment at Porto Novo. First rate Wootz is manufactured from it. It is also used by the native smelters, who informed me that the best sort of ore is got from two hills about one and two koss distant to the SSW. of the village, which they say are full of the ore, and are called Callurchan and Moorgutta Mullaye. The natives here employ a mixture of black magnetic sand from the Nullah beds with the steel grey magnetic oxide in the manufacture of steel. The native furnaces rarely produce more than from four to six maunds of iron per diem, which sells on the spot for one rupee or less per maund. The steel and iron of Nagrepetta is

most prized by the natives, but whether this excellence is attributable to a better mode of smelting or better ore, does not appear. According to the natives, about 100 families of the Dhairs at Ahtoor are employed in getting iron ore ; there are about thirty or forty iron furnaces in this vicinity.

Ahtoor lies near the base of the great break of Salem, where the high table lands of Mysore, the Balaghat, &c. descend by an abrupt step to the plains of Salem and Coimbatour. To the south of this break, a broken *disjointed mass* of bare rocks forms a sort of talus to the lofty steeps on the North ; but separated from them by a narrow and in general flat-bottomed valley, along which the road runs to Salem. The extreme height of the ranges to the right (or N.) by a rough trigonometrical observation from a paced base, I made to be (?) feet above the level of the valley, or foot of the break at Ahtoor. And Ahtoor by the boiling point of water I find to be about (?) feet above the sea : but these observations must only be regarded as some approximation to the truth.

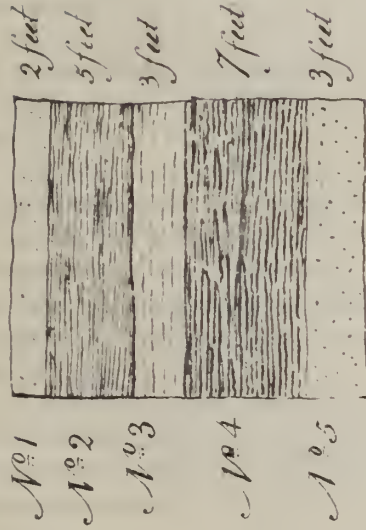
The subjoined diagram* will give an idea of this profile presented in the bolder parts of this great feature, in the physical configuration of South India. The rocks to the South of this break, after running southerly some miles, attain near Shendanumgalum, not far from their termination to the SW., an elevation little inferior to that of the ranges on the North of the break. The break itself varies from one and a half to three or four miles in width. It contracts East of Ahtoor, and opens out West of it as Salem is neared, and is about fifty-six miles long.

Ahtoor was formerly held by a Poligar, the remains of whose palace, are still to be seen in the fort, a low building supported on Saracenic arches, and covered with a terrace roof. The fort which was, it is said, built about four centuries ago by the then Poligar, Ghut Moodely, stands on the North bank of the river, rectangular in shape, and provided with wet ditch, glacis and covered way, except on the South face, which is washed by the river. The walls are of stone, with a ruinous brick parapet, garnished with mud bastions, and square cavaliers in the usual Hindoo style. It is entered by a gate on its eastern face : and, besides the palace, contains two temples to Siva and Vishnu ; the remains of buildings occupied by the European garrison

* See plate.

Diagram to 12 III
of Capt. Newbold's
Geological Notes across
the Peninsula

Section of Well 20 feet deep



which held it after the fall of Seringapatam; granaries, powder magazines, and in the NW. angle, a tomb inscribed to the memory of Lieut. Colonel John Murray, 1st Cavalry, who died 1799, erected by his widow, (6th May) also an obelisk, from which the inscription evidently has been shamefully removed.

Ahtoor is now the *Kusbah*, or capital town, of a Taluk, Lat. N. $11^{\circ} 40'$ and Long. E. $78^{\circ} 48'$. It comprises, the natives say, upwards of 1,200 houses, occupied chiefly by *Kuddiyans*, or cultivators, (exclusive of the Nellalo, Pulli, Agmuddi, Nattaman, Mullayman, Latraman &c.) and Dhairs, chiefly engaged in procuring and smelting iron. There are also nearly fifty families of Brahmins, of whom the Smaltal sect is much the most numerous; next the Maduals, and finally the Sri Vaishnovams. There are about fifty houses of Mussulmans, chiefly employed as peons, in mat-making, day-labour, and a few in agriculture. To hold the plough is almost a *dernier resort* with a Mussulman of South India.

The houses are neater, and more cleanly than any I have seen in this part of India, and are often tiled. Mr. Fischer, who may be truly styled the Salem Zemindar, has a depôt for indigo and cotton here. I saw thirty-six women and children employed in cleaning cotton, which is done by means of wooden cylinders, resembling those of an Indian Sugar-cane mill on a small scale, revolving horizontally, and turned by the hand.

The table land on the hills to the North is said to be held free by Poligar Pedda Collaray. It produces hill rice, castor-oil plant, *Kimbgoni*, and a little common rice. The produce of the land about Ahtoor is much the same as at Chinna Salem. The water of the wells is often brackish.

Salem.—From Ahtoor to within three miles East of Salem, the Pass continues along the southern base of the elevated table lands of the Balaghat. Near Salem the mountains which support them assume a bolder and more indented outline, rising in separate conical peaks, domes, and abrupt ridges. The highest peak of the Moolnad by rough trigonometrical calculation, is upwards of 3000 feet above Salem, and Salem itself, by the boiling point of water, is about 1,131 feet above the sea.

The same formation prevails around Salem as at Ahtoor. The gneiss is often penetrated by veins of eurite, of a faint reddish and

greenish white; and with red felspar coloured with actynolite and chlorite. Hornblende schist is very prevalent, mica and talcose schists less so.

The foot of the steep descent of the Shevaroy hills is about six miles to the N. by E. from Salem. The granite losing its mica passes often into a pegmatite, and gneiss into leptinite.

Both Regur, alluvial reddish, sandy and clay soils, and *mussub* or regur mixed with alluvia, are found around Salem. The staple productions are cotton, indigo, rice, bagra, and *juari*. The table lands of the Shevaroy hills produce fine coffee, of which extensive plantations have been recently formed.

Heyne tells us that formerly the East India Company had an establishment for the *purchase* of cotton-manufactured goods here, but now English cotton cloths drive the Indian out of the market, and the raw material is exported to England, manufactured into cloth, and under-sells the Indian cloth after having performed two voyages, collectively equal to the circuit of the globe.

The subsoils are *kunker* and *mhurram* (gravelly detritus of rocks in situ) saltpetre, murate and carbonate of soda, occur in the surface soils.

Salem.—Salem is capital of a collectorate of the same name, situated Lat. North $11^{\circ} 41'$ Long. East $78^{\circ} 14'$ in the plain a few miles to the SW. of the great break in the table land of the Balaghat, which here descends upwards of 3000 feet to the plains of Salem and Coimbatore, by the steeps of the Shevaroy mountains.

The Civil and Judicial head-quarters of the district are fixed here, though the collector generally resides at Ossoor, on the table land. A detachment of Native Infantry, furnished from the garrison of Trichinopoly, of three Companies, supplies the treasure and jail guards, &c. (March 1840.)

The native town lies on the left or eastern bank of the Tirrimani stream, which empties itself into the Cauvery, and separates the town of Salem from the fort, barracks, and residences of the Europeans. It is about sixty paces broad, and crossed by a bridge of five arches. During the dry season, like the other streams of South India, it cannot boast of too much water.

The native town is nearly a mile in length, the main street broad, clean, and in general well drained.

The houses are usually tiled, with verandas in front, supported by wooden pillars, and sheltered from the oblique rays of the sun by awnings of cotton cloth. The market day is held on Tuesday. Beside cloth manufactories, Salem boasts of the best steel manufactory in South India, and the name of Arnachelum, for beautifully tempered heads for hog spears, and *couteaus de chasse* stands unrivalled. The iron and steel come principally from Ahtoor, Tumbumpetty, Shendamungalum, Trimulkerry, and Namgurpett, Indigo is another of its principal exports.

A considerable quantity of salt-fish is imported from the Western Coast.

The population of the town and suburbs cannot be less than 35,000, of which the weavers form the greater proportion.

The fort is of mud and stone, and now a *ruin*. It was built by Chinnaper, and contains a temple to Alighirry Permalvo.

Mr. Fischer holds lands in and around Salem, amounting to about 1,25,000 acres, from the Government, on the yearly payment of 5,000 pagodas. He has an experimental garden here, which is promising, in which I observed tea from Assam, Guinea grass, Otaheite sugar-cane; and among many other rare fruits, the apple and pear, which do not appear to thrive.

The physical aspect of this district is particularly varied and beautiful, extending over the table lands of the Balaghat, and over the plain of the Baramahal, which is said to be 550 feet higher than Salem. Besides the Jiwadie, Shevaroy, and Ahtoor ranges already touched on, and which belong to the line of Ghaut elevation, are the ranges of Shendamungalum and Collymully, on the SE. confines of the district, all inhabited and cultivated. To the South-westward, the country is more open, and descends slightly in a plain to the bed of the Cauvery, which, with the Palaur in the Baramahal, are the principal and almost only drainage lines of any importance, East of Salem the slope is easterly to the sea. In the Baramahal, towards the NE., the area is estimated at 6,520 square miles, of which only about 3-10ths are cultivated, with a population, (exceeding that of Coimbatore) of 9,05,000 souls, or about 112 per square mile, chiefly employed in agriculture and weaving. The annual revenue is about 19½ lacs of rupees.

The roads through the Salem district, made under the judicious directions of Mr. Orr, are the best in the Madras Presidency.

Chrome and Magnesite Mines.—From Salem I visited the Chromate of Iron and Magnesite mines, of which an account will be found in the Journal of the Royal Asiatic Society, No. XIII, for May 1842. The former are situate about four miles to the NW. of Salem, in a bed of magnesian rock, analogous to serpentine, and associated with talcose mica, and hornblende schists, and gneiss.

The mineral is found in veins with the magnesite, the mines for which are hard by: but the latter seems to exist in greatest abundance in the hornblende schist, which is highly garnetiferous.

The mining tract is an assemblage of low broken rocks, spreading over an extensive jungly tract, at the West base of the Shevaroy mountains.

Sankerry-droog. The rock on which stands this old Droog, is about twenty-four miles SW. from Salem. It is composed of a fine porphyritic granite, which has broken up the gneiss on its flanks, and rises boldly from the plain to a height (approximated by a trigonometrical observation from a paced base) of 930 feet.

The sides are masses of bare rock, often precipitous, between which not unfrequently pushes forth a vigorous vegetation.

The porphyritic granite has invaded the hypogene rocks, and burst through them in innumerable dykes on its SW. flank; the gneiss rests like a mantle, with a general dip of 75° . S. $15'$ W. but the strata are in much disorder and confusion. On the western side, the gneiss is seen interstratified with layers of hornblende, actynolitic schist, and garnet rock, in which is a layer of a fine crystalline limestone, (marble) which from its effervescence with acid, and peculiar appearance and weight, I should think is magnesian. Near its contact with the garnet rock, its substance is starred with innumerable minute garnets, both red and green: Garnets of a light brown colour, resembling cinnamon stone, also occur in this limestone stratum; the limestone is scamed by a dull amber-coloured hornstone, which penetrates the rock in thin seams, and stands out in relief on the surface of the more rapidly weathering limestone, giving it a grooved and corrugated aspect.

The green garnet is found in the largest crystals, in the white quartz veins which intersect the hornblende schist and gneiss. The green

garnet, (if so it is, for I have not yet had opportunity of submitting it to analysis) is in general of the foliated, rhomboidal variety, and with its white quartz matrix form a very beautiful rock. The quartz imbedded also a mineral of a hair-brown colour in hexagonal prisms.

The variegated appearance imparted to the limestone near the line of junction by the admixture in irregular lines of red and green crystals, is curious and interesting.

These beds can be traced on the side of the rock till they disappear under masses of porphyritic granite, which have slid down from above. In contact with veins of granite the garnet rock acquires a glazed surface, and a disposition to split into prisms when struck with a hammer.

The felspar of the porphyritic granite is usually reddish; the mica dark green, and the quartz of a light transparent grey. The two latter minerals are occasionally wanting; the felspar becomes a granular or compact paste, imbedding larger crystals of felspar; in short, a true porphyry.

The country surrounding the base of this rock, which affords so instructive an example of the effects of Plutonic intrusion among the metamorphic schist, is bold and rocky; and, towards Salem, the dark low ridges show that hornblende schist is the prevailing rock, intersected by low ridges of white quartz.

Near Sankerry-droog granite and gneiss are more common; the presence of the first being clearly indicated to the traveller by the bolder aspect of the country.

The gneiss and other hypogene strata are almost every where bent and contorted. The Traveller's bungalow stands on a bare surface of gneiss, presenting a curious example of contortion, and the rock of Sankerry-droog is a finer example of granite veins in gneiss than the far famed Cape Wrath itself, figured by McCulloch and Lyell.

The soil is mixed regur and red alluvial; saltpetre is manufactured in the vicinity.

The hill fort was once a place of great strength, and originally built by a Beder Poligar, it was subsequently strengthened by Hyder and Tippoo, and within the last twenty years was garrisoned by the Company's troops.

The village of Sankerry-droog now contains nearly 300 houses, chiefly of Telinghi, Bulgawar, Mahomedans, Pullaywars, Yeddyers, cloth-weavers, and a few Brahmins of the Madul, Smartal and Sri-vaishnavam sects; the first predominating. It is worthy of remark that a few Canarese families are to be found here, also a few Telas and Comtis. Saltpetre and silk are manufactured here.

The Thermometer (Faht.) placed on the naked rocks at this place, at 2 P. M. in a clear tranquil day, and fully exposed to the sun's rays, stood at 120° , at $5\frac{1}{2}$ P. M. 100° .

About six feet above the rock's surface it indicated 110° at 2 P. M., shade 90° , and at $5\frac{1}{2}$ P. M. 90° , shade 82° .

On the sandy soil at 2 P. M. the mercury rose 4° higher than on the rock.

The temperature of a spring was $82^{\circ}4$. These observations were made in the middle of March.

Erode. From Sankerry-droog to Erode, which lies about $1\frac{3}{4}$ mile on the right or South bank of the Cauvery, there is a gentle sinking of the face of the country towards the bed of the river; the formation is chiefly gneiss and hornblende schist; strike of strata towards S. 20° E. and dip at an angle of 80° E. 20° N. There are many irregularities and exceptions to this rule.

The mica of the gneiss in the bed of the Cauvery near Erode is dark shining and foliated.

The surface of the rock has been scooped out by the action of the water into longitudinal furrows and troughs, following the line of stratification, which here happens to be parallel to the course of the stream.

An examination of the grooves and troughs is interesting in many points; and especially as demonstrating the difference caused either by the action of water alone, or by gravel and sand hurried along by water over rocky surfaces, in contradiction to the furrows resulting from glacial action.

The latter run on in straight undeviating parallel lines, unaffected by the different degrees of hardness of the rocks, while the depth of the former, and sometimes even their direction, perpetually varies with the varying resistive powers of the rock, and are particularly obvious

whenever quartz or chert veins happen to cross the gneiss in the direction of the stream, when they stand out usually in relief, and but little comparatively worn down.

In the channel of the river I found a coarse sand and gravel consisting of rolled fragments of quartz, syenitic granite, granite porphyry, basaltic greenstone, augite rock, hornblende schist, reddish porphyry, with tourmaline, like that higher up in the bed at Serin-gapatam, chert, jasper and iron ore, (oxides and hydrates). The sand contained magnetic iron sand, garnet, corundum, and a pale sapphire-coloured quartz the latter rarely; evincing the existence of mines of these minerals in the rocks higher up the bed.

The corundum, ruby, and sapphire are all known to exist in the Permutty Taluk lower down, and the beryl at no great distance.

The Cauvery at Erode divides the Salem and Coimbatore Collectories. Erode stands in the latter, and is Kusbah of a Taluk of the same name. Latitude $11^{\circ} 20' N.$, longitude $77^{\circ} 48' E.$ Buchanan states that, under Hyder's government, Erode numbered 3000 houses; in Buchanan's time it had scarcely more than 300, having been sacked by General Meadows' army in the war with Tippoo. The population has not much increased, it consists of the same castes as at Sankerrydroog, with Brahmins of the three sects.

The cultivation is principally rice, the produce of a tract watered by a canal from the Bhowani river to the North, dug, it is said, by a Vellala, named Kalinga Raya Conda.

The ruins of the extensive mud fort, formerly one of our garrison, now contains nothing but a pagoda, the houses of a few Pujaris (officiating priests), and a depôt for saltpetre manufactured in the vicinity, the property of Mr. Fischer of Salem.

The earth from which it is here obtained is that from the sites of decayed villages. It is reddish in colour, and mingled with old coarsely pulverized brick and mortar, wood ashes, and decayed vegetable and animal matter. The saltpetre is extracted by the usual process of lixiviation and evaporation, and boated down the Cauvery from Moganore during the monsoon months, to Nagore, whence it is shipped by sea to Madras.

The boiling point of water in this part of the Cauvery valley indicated a depression below the plains of Salem of about 250 feet.

Chennamulla.—From Erode to Chennamulla a number of rocky undulations are crossed, running parallel with the strike of the strata nearly SSW. The formation is gneiss alternating with mica, and hornblende schist, with layers of actynolitic schist. The dip is generally E. 15° S.

The hill of Chennamulla is a mass of stratified quartz sprinkled with garnets and passing into garnet rock. Some of the imbedded garnets are tolerably well crystallized, and of deep rich colour. The prevalent form of crystal is the dodecahedral, the rhombic dodecahedron (Almandine) is not so common. The gneiss is often coated with incrustations of a flesh-coloured kunker: and beds of it form in many places the subsoil. The surface soil is in general reddish and gravelly.

At the foot of the rock I picked up a fine garnet imbedded in a nest of a dark fibrous hornblende.

Beryl mines of Konghyum.—From Chennamulla I visited the Beryl mines of Konghyum, of which a description has been already given by me in Jamieson's Philosophical Journal.

I shall now content myself by pointing out, that they lie close to the village of Poddioor in the Konghium Taluk, about forty miles ENE. from the town of Coimbatore, which lies in 11° N, and $77^{\circ} 1'$ E. It occurs in the vicinity of granitic, porphyritic, and pegmatitic veins in the gneiss, associated with fine specimens of rock crystal Cleavelandite, and, though rarely, pyramidal felspar or scapholite. Konghium was the ancient name for the Coimbatore district.

Avenashy.—Gneiss, and hornblende schist penetrated by granite and basaltic greenstone, are the rocks next within the plain around Avenashy. Dip of strata, E. 10° S. strike N. 10° W. Soil and subsoil similar to those of Chennamulla. Saltpetre is here manufactured from a mixture of old village refuse with the rich vegetable soil dug from the bottom of a tank. Patches of the ordinary soil are seen moist with impregnations of soda. The staple articles of produce are *juari*, *raggi*, and *bajra*. Cotton is grown at a little distance in the *regur* plains. Cotton cloths are here manufactured.

The village is pleasantly situated in the plain at the base, and within view of the towering peaks of the blue mountains; it was anciently a place of note, but has decayed latterly, and the Kusbah is transferred

to Cheyoor It now comprises about 100 houses, principally of the cotton-cloth weavers, comtis, musicians, (*Bajindris*,) dancing girls, Pullaywars, and Bralimans principally of the Smartal sect.

It possesses a temple of some sanctity, and holds a *Jatra* and great cattle fair once a year, in the month Chaitra. The temple, which is dedicated to Iswara, faces the East, and is approached by a bridge built in the old Hindu style as at Bijanugger, that is, formed by slabs of stone resting horizontally on perpendicular stone pillars, sunk in a triple row into the bed of the stream. Near this is a colossal statue of the sacred bull.

The great archbishop, or Swami of the Smartal sect, Sencra Bharti, of Singlery *Math*, has a branch *Math* here, now under charge of Mathmudra, Samana Shastri.

Coimbatore.—As the base of the western ghauts is approached, the plain undergoes a gentle but sensible rise. It is now covered with wild vegetation, and its surface more rugged with the channels of the Ghaut streams. Patches both of red soil and regur cover for the most part the subjacent rocks, which the sections afforded by wells, banks of streams, &c. show to be hornblende schists, gneiss, with large beds of quartz, and dykes of basaltic greenstone. The subsoil is generally either a gravelly detritus of these rocks, or beds of kunker from one foot to twelve feet thick; often grey, and ash-coloured. In some places both red and black soils abound in soda and common salt, and excellent saltpetre is extensively manufactured.

The staple articles of cultivation, are cotton, juari, bajra, tobacco, and rice. The Company since my visit have established a cotton farm here, under the able superintendence of Dr. Wight, the principal object of which is the improvement, by a better course of agriculture, of this staple, for European markets; Indian cotton being decidedly inferior to American in this respect; also the trial of the introduction of the cotton plants of other countries, viz. America, Bourbon, &c.

Iron ore, principally the black magnetic sand, is smelted at Topumbetea and Contempully, it is found near Colengoda, and in most of the hilly districts north of the town. According to barometrical observations by Messrs. Baikie and Dalmahoy, the palace of Coimbatore is 1483 feet above the sea's level. This pretty nearly coincides with the height given by the boiling point of water on the ground of the mili-

tary lines, which I found to give 1416 feet. Coimbatore town lies about sixteen miles to the E. by N. of that singular gap in the Western ghauts, the Paulgaut Pass; it is laid out on the surface of a high plain in regular and broad streets, lined with houses having tiled roofs, and verandas in front. The houses have rarely an upper story, and are inferior to those of Salem. Near the middle of the town stand the remains of a palace built or rebuilt by Tippoo, who made it his occasional residence. It is used as a kutcherry and depôt for tobacco, which is brought here in large quantities from the interior for export to the Malabar Coast. The palace hardly deserves the name. It is a terraced, massive building, with open quadrangles, closed by ponderous gates. A neat mosque is pointed out as also erected by Tippoo.

About a mile on the rising ground to the NE. of the town stand the barracks and officers' quarters, occupied by two companies of Infantry and their officers, from the garrison of Trichinopoly. Here is also the Chapel and burial ground of the Church Mission. The Traveller's bungalow and post office are in the town. The fort is a complete ruin. There are also a Roman Catholic Chapel, four mission schools, and two private English schools.

About five miles westerly, at Perur, is a temple to Siva, called Mailchittumbra, celebrated for its sanctity, and as having been one of three pagodas spared by Tippoo. The others were those of Seringapatam and Mailcotta in Mysore. The natives assert that this temple was built 3000 years ago by one of the Pandion kings of Madura; but I did not find any inscription on stone to corroborate such an assertion.

The temple itself is neither grand nor beautiful; but the style and rudeness of the architecture and sculpture indicate a considerable antiquity.

The province of Coimbatore was formerly part of the Chera kingdom. *Perur*, just mentioned (or the city), is supposed to have been one of its greatest towns, and the Talakad, on the banks of the Cauvery, which separates the northern extremity of Coimbatore from Mysore is said to be on the site of its ancient capital (Dalavanpura.)

I cannot find that the present capital town, Coimbatore, was of any great ancient importance; it probably rose upon the decay of its neighbour Perur. The descendants of the old sovereigns, the Velar Rajas, still exist, I am told.

The physical aspect of Coimbatore, though broken by hills on its northern, western, and southern confines, presents, generally speaking, an undulating open plain, sloping away southerly and easterly from the great break of the Ghauts,—with an average elevation of about 900 foot above the sea. The Cauvery, to which the inferior lines of drainage, viz. the Bowany, Noel, and Amberutty converge, carries off the superfluous water to the Bay of Bengal.

Its area is estimated at about 8,400 square miles, with a population of upwards of 800,000, of which about 8-10ths are engaged in agriculture and weaving. The number of females, according to the census published in the Madras Almanack for 1839, slightly exceeds that of the males, which whether fact or not, is a circumstance worthy of enquiry, in a country where (among the Mahomedans) polygamy is allowed, marriage a religious duty, and concubinage and prostitution prevalent among all castes and sects. The revenue is estimated to average 21 lacks of rupees annually.

Coinbatore, at an early period of its history, fell into the hands of the Madura Rajas, and in the 17th century was wrested from them by the Mysore Rajas, from whose hands it fell into those of Hyder and Tippoo. The English took it from Tippoo in 1783, but restored it at the peace 1784. Again taken possession of in 1790, repulsed the efforts of Tippoo to storm it, but afterwards surrendered on terms which were violated, and the garrison detained prisoners until the peace of 1792. Since the fall of Seringapatam in 1799, it has formed an integral part of our possessions.

The population of the town of Coimbatore (1840) is said to be from 25,000 to 30,000 souls—composed chiefly of weavers, agriculturists, and merchants, Brahmans of the three chief sects, as at Sankerry-droog. Mussulmans, musicians and dancing girls are numerous here, as might be expected.

Tamul and Canarese are both spoken at Coimbatore, which approaches the southern boundary of the ancient kingdom of Karnata, where Canarese almost exclusively prevails, and also the eastern boundary of Malabar, where Malayalim is the vernacular language of the country.

Pass of Palghaut.—This great chasm in the wall of the Western Ghauts is about fifteen miles in average breadth from N. to S. and

about twenty-eight miles long from E. to W. It is about twenty-eight miles wide where it opens upon the Malabar coast, and twenty-two at its debouchment on the plains of Coimbatore; between these points its width is irregular, but it narrows in some parts to eight or nine miles. Its surface, and the lower flank of the Ghauts on each side, are covered with elephant jungle and thickets of bamboo growing in a thick reddish and grey soil, which cover the rocks, and are great obstacles with the jungle to geological examination. Glimpses are occasionally obtained in passing through this forest of the lofty heights of the Nilgherris and Koondas, which flank the right of the Pass, some of which tower 2000 feet above it, and of the mountains, which resume the line of elevation on the left.

The bottom of the Pass is a plain, gradually rising toward the west by rocky undulations running parallel with the line of elevation, which cause alternate rises and falls in its surface. The ascent from Coimbatore and the descent to the sea-coast on the other side are so gentle, that I conceive it probable that the height of the Pass never much exceeds that of Coimbatore itself.

The boiling point of water makes the town of Palghaut on the Western slope 7-10ths of a degree lower than that of Coimbatore. Down the middle of the Pass winds the Ponani river to the Malabar Coast, and the Indian sea. It is formed by rills from the Ghauts uniting in the centre of the Pass west of the water-shed.

The rocks observed in the Pass, and on its Northern flank, were chiefly of gneiss and hornblende schist, massive hornblende rock, and a small grained quartzite granite, with both black mica and hornblende: the mica is occasionally wanting.

The mass of gneiss on which the Traveller's Bungalow at Woli oor stands, is of the variety which is termed by geologists granitoid, or thick-bedded gneiss, and by others, laminar granite. This however though its structure may appear granitic in hand specimens, is evidently a stratified rock, and is seen, a few miles westward, to pass into a beautifully characteristic, stratified gneiss, which imbeds small black shining scales of mica, and a granular white quartz in alternate layers.

A large grained granite penetrates the gneiss, often containing large reddish crystals of foliated felspar, greenish felspar coloured by actinolite, and occasionally adularia.

The strike of the stratification is generally W. 5° N., and dip 80° S. 5 E. Stratification, with the help of a telescope, is seen beautifully distinct in some of the highest bare peaks which occasionally overlook the Pass;—for example, North of the hamlet of Ganjicota, where the Pass opens out to the Westward.

The sand brought down the mountain sides by rills and streamlets, consists chiefly of quartz and mica, with magnetic iron sand, and occasionally particles of gold found after heavy rains, comminuted garnet and hornblende, and rusty ferruginous particles. Bits of the bronzite and hyperstene varieties of hornblende are also met with in thin beds.

The surface soil, when mingled with the decayed vegetable matter of the forest, forms an ash-grey coloured mould, soft and friable to the touch; this is the prevailing soil. Around protruding rocky masses, the usual reddish alluvium and detritus from the surrounding rocks, prevails.

The subsoil is usually a bed of angular gravel, the under fragments of these rocks. Beds of clay and kunker are occasionally substituted.

While journeying through the forest, the more than midnight silence of a tropical noon was suddenly disturbed by the loud crashing of the tall, dry clumps of bamboos, and underwood of the jungle in front of us, as if some infuriate elephant was advancing upon us in all the frenzy of the periodical madness these animals are afflicted with. Raising our eyes in haste, we beheld a tall white column of dust madly gyrating here and there, high above the highest trees of the forest, whirling about fragments of sticks and leaves, the wreck of the bamboo clumps in which its lower extremity was performing most destructive gambols.

After crashing about for some time, its lower half, like that of a water spout, separated from the upper or more celestial portion,—which curling upwards gathered itself into a canopy, or cloud above our heads, from which dropped the heavier particles it had whirled into mid-air; then gradually dissolving it vanished, leaving the forest to its former death-like stillness, after a temporary disturbance of three minutes.

Such is a *Peshash* (a devil) in the jungle.

The Thermometer stood in the shade at 116° , and a death calm prevailed in the surrounding atmosphere.

Puducherry.—Near the little fort of Puducherry, which is in the Pass, the laterite of Malabar (for the Salem boundary was crossed near the Ponani stream) is seen resting on gneiss; between this and Palghaut the country is less jungly, but still well wooded, with fine trees.

Palghaut.—This town, fort, and military station stands near the opening of the Pass on the Malabar coast, and is about fifty-two miles direct distance from the sea, and about four miles W. of Puducherry. The Ponani stream is navigable for boats to within fifteen miles of Palghaut.

The town is almost surrounded by the Agrarums of Brahmans and enclosed estates of wealthy Nairs: it is laid out into neat streets: the houses look clean, and are usually tiled or thatched with the bamboo and palm leaf.

The pagodas here and elsewhere in Malabar, (the old Malayalam kingdom) differ from those of the Carnatic and Balāghat in being covered with conical tiled roofs, like a Malay mosque, and in wood being largely employed in their construction. The different physical features of the country account sufficiently for this difference in the religious architecture of the Malayalam nation. Granite is scarce, and usually lies at a distance: the porous laterite would make indifferent roofing slabs; whilst the great forests of Malabar yield a never failing and cheap supply of the finest timber.

The roofs of the pagodas terminate in the usual gilded *Calas*. The colossal equestrian statues so common in the Chola kingdom, are now no longer seen, but in their room we have the isolated granite blocks of Carculla carved into the gigantic statue of Gomuta Raya.

The fort stands on the commanding ground on which the Military lines are built, about three-quarters of a mile easterly from the pettah.

The fort is small, but well put together, of stone, in shape quadrangular, and consists of a curtain flanked by round bastions; the whole surrounded by a wet ditch, covered-way, and glacis. The only gate faces the east, and is protected by an outwork in the European style,

the work, probably of some French engineer in the service of Hyder, who is said to have built the fort itself, in 1766, but at all events remodelled it.

The parapet is high, pierced with loopholes for musketry, and the bastions with embrasures for guns. I counted about forty guns, rusty and apparently unservicable, lying about the place.

Palghaut is now the head-quarters of a regiment of Native Infantry : It is the key of the Coimbatore and Salem districts, from the western coast.

It used to be noted for the manufacture of furniture. Rice is the staple article of cultivation. The mountains in the vicinity can supply large quantities of teak and other valuable timber. The pepper and cardamum flourish on their sides and in their defiles ; and their forests shelter herds of bison and elk, whose horns form an article of traffic.

Palghaut before Hyder's time, was under a Wair Raja, who was in some measure feudatory to the Hindu Rajas of Mysore.

On their downfall, it fell into Hyder's hands, who strengthened it as a Military post, commanding the only communication with Malabar from Coimbatore.

It was early seized by the English in their wars with Hyder ; evacuated 1768, by Lieut. Bryant ; retaken 1783, by Col. Fullarton ; again fell into the hands of Tippoo, but retaken in 1790, by Col. Stuart.

The Pass of Palghaut, as might be anticipated, exerts a considerable influence over the meteorology of the places to the East and West of it. In the SW. monsoon while the table lands of the Balaghat, and the plains of the Carnatic, sheltered by the great wall of the Western Ghauts, are burnt up with the rays of a scorching sun, the places immediately to the East of this wide gap are favoured with a portion of the cooling showers and breezes which are wafted through this mountain opening over the forests of Malabar from the Indian ocean.

On the other hand, it serves as an outlet to those furious storms from the Eastward, which sweep the Bay of Bengal, and after traversing the peninsula, burst forth through it to the Indian sea.

Vaniencolam.—This is a village in South Malabar, about twenty-four miles and a half W. by N. from Palghaut. Like most Malabar villages in the interior, it consists of huts in separate enclosures,

shaded by the cocoa, areca palm, and the jack, spreading over a large area, the surface of which is diversified with two wooded hills, and watered by numerous mountain rills.

The Traveller's bungalow stands on one of these low eminences on a bed of laterite resting on gneiss. The gneiss is hornblendic, strike of strata W. 50° N., and dip 86° S. 5° E.

The soil is red, and often consists of a barren laterite detritus. A well, twenty-four feet, is cut in the laterite.

A market for salt fish from the coast, cotton cloths from Coimbatore, &c. is held here every Saturday. Approximate height above sea by boiling point, 393 feet.

Waliyar.—A tiled Bungalow for the accommodation of travellers, has been erected by a liberal native banker of Coimbatore, named Bismam Singh, in this forest hamlet, which consists only of a few rude huts. The surrounding jungles are rather notorious for being the favourite haunt of the tiger and elephant at certain seasons. Few instances, however, have been recorded of their attacking travellers. The natives affirm it is dangerous to sleep here during the cold months of November, December and January, on account of a jungle miasma which engenders fever. Laterite is the prevalent surface rock.

The approximate height above sea by boiling point 283 feet.

Tirtalla.—This is a large village in S. Malabar, a few miles from Palghaut,, about sixteen miles direct distance from the sea at Panani. It is pleasantly situated in a valley, flanked by hills of gneiss and hornblende schist partially overlaid by laterite, on the banks of the Walliyar or Ponani river. The strata of gneiss, which is highly weathered, run E. by S. and dip 45° toward the S. The banks of the river consist of a loosely consolidated laterite clay and sandstone overlying a bed of a stiff black carbonaceous clay. It is not improbable that lignite and mineral copal exist in this vicinity, as I found a small fragment of the latter in the river bed. The sand which covers it, is quartz and micaceous. On digging to the depth of five feet, I found layers of a white coloured sand alternating with sand of a ferruginous colour and thin layers of a dark brown clay passing into black.

The soil in the rice grounds is a sandy clay mingled with decayed vegetable matter.

The staple article of cultivation here is rice, and the prevailing castes, are Namburis, Tiars, Moplays, Churmars and Vellalis.

In the jungle I saw some of the squalid aborigines of Malabar,—the Neadis—who reminded me in feature and lowness of stature of those of the Malay Peninsula, and of the Chensu-var, inhabiting the jungles of the Eastern Ghauts.

Betiagady.—The houses, or huts rather, composing this Malabar village, are scattered as usual over a large space of ground. The flat, cultivated rice vallies run down towards the sea, flanked by steep, low ranges of laterite, like so many rivers enclosed by banks. The soil is lateritic, manured chiefly with decayed vegetable matter and wood ashes.

Staple article of cultivation, rice; and the prevailing castes much the same as the last march. The Traveller's bungalow stands on a low hill of laterite, which by the boiling point is about 320 feet above the sea.

The temperature of water in a well twenty feet deep, in laterite, was 82°. Of air in shade at the time (March 23rd, 5 P. M.) 87°.

Beypoor.—The sea is first seen at Beypoor, a large village at the mouth of the Beypoor river, Lat. N. 11° 12', and Long. E. 75° 52'. The cliff on which the Traveller's bungalow is pleasantly situated, is of laterite. It is on the north bank, and commands a good view of the embouchure and bar. The prevailing rock is laterite, running down in low flat topped ridges from the interior, separated by flat bottomed tortuous vallies, which have been evidently scooped in it when the land was uplifted from the bed of the sea. These ranges usually terminate in precipices of from forty to one hundred feet high at the sea.

The laterite embeds layers of lignite associated with sulphates of iron and alumina (the result probably of the decomposition of iron pyrites,) and occasionally mineral copal. The largest bed of lignite occurs at the base of the cliff of lateritic sandstone, which overlies it a short distance up the river, on its right bank, in a bed of black and grey micaceous slate clays and shales.

Beypoor was formerly a favourite sea-port of Tippoo, who styled it Sultan-patnam, the city of the Sultan; he constructed a fort on the river, warehouses, and an arsenal.

The Portuguese formed an early settlement here. The ruins of this fort are still pointed out by natives on the sand bar. The river is navigable during the monsoon many miles into the teak forests of the interior, and affords a capital mode for the transit of ship-building timber, by rafting to the coast. A low mill with sails moved by the wind is standing, but I believe no longer in use. A large quantity of timber is still shipped for the supply of the Dock-yards at Bombay, and large vessels (to 700 tons) are occasionally built here. Sail-cloth is manufactured, and excellent tar from teak-wood shavings and saw dust.

The village contains about 400 houses, inhabited chiefly by Tiars, Mairs, Polliars, Churmars, Soottars, Mukkoons; with a few Nam-buri Brahmans, Kunnishuns, and Moplays, and has a busy thriving appearance.

The Beypoor river is one of the most considerable in Malabar. It will admit vessels of 300 tons within the bar, and it is navigable during the greater part of the year to Ariacode, twenty-five miles, and during the monsoon to Nellumboor, the principal teak forest, forty-four miles. In its sands after the rain, and along the sea-coast, gold dust is frequently found in small quantity.

Proceedings of the Asiatic Society of Bengal, NOVEMBER, 1845.

The stated monthly meeting of the Society was held on Wednesday evening, the 5th November, G. A. Bushby, Esq. B. C. S. in the chair.

The following new member was ballotted for and declared duly elected :

Licut. D. Briggs, B. N. I.

And the following new members were proposed :

J. Christian, Junior, Esq. Monghyr,—proposed by the Sub-Secretary, seconded by the Secretary.

W. Taylor, Esq. B. C. S.,—proposed by the Secretary, seconded by the Sub-Secretary.

A. Wattenbach, Esq.—proposed by the Secretary, seconded by the Sub-Secretary.

Donald Mackey, Esq.,—proposed by E. Blyth, Esq. seconded by S. G. T. Heatly, Esq.

Ensign F. H. Riply, 22nd N. I.,—proposed by E. Blyth, Esq. seconded by the Secretary.

L. C. Stewart, Esq. M. D. Assistant-Surgeon H. M. 39th Foot,—, proposed by E. Blyth, Esq. seconded by the Secretary.

W. Theobald, Esq. Barrister at Law,—proposed by E. Blyth, Esq. seconded by the Secretary.

T. C. Jerdon, Esq. Madras M. S.,—proposed by H. Torrens, Esq. seconded by E. Blyth, Esq.

The following list of books, presented and purchased, was read :—

List of Books received for the Meeting of Wednesday, the 5th November, 1845.

BOOKS PRESENTED.

1. Calcutta Christian Observer for October, 1845.—By the Editors.
2. Oriental Christian Spectator, vol. 6, No. 10, for October, 1845.—By the Editor.
3. Mekhitaristes de Saint-Lazare, Histoire d'Arménie, par le Vaillant de Florival. Vanise, 1841, 1 vol.—By J. Avdall, Esq.
4. Nuovo Dizionario Italiano—Armeno—Turco. Comp. dal P. E. Ciackuak. Venezia, 1829, 1 vol.—By J. Avdall, Esq.

5. On the Temple of Somnath, by Col. Sykes, 1843, P.—By the Author.
6. Bhuddhism versus Brahmanism, 1842, by Col. Sykes, P.—By the same.
7. On the three-faced Busts of Siva, by Col. Sykes, P.—By the same.
8. Inscription from the Boodh Caves near Joonar, by Col. Sykes, P.—By the same.
9. On the Population and Mortality of Calcutta, by Col. Sykes, P.—By the same.
10. Statistics of the Educational Institutions of the East India Company in India, by Col. Sykes.—By the same.
11. First report of a Committee of the Statistical Society of London, on the State of Education in Westminster, 1837, P.—By the same.
12. Report on the Vital Statistics of Large Towns in Scotland, London, 1843, P.—By the same.
13. Statistics of Cadiz, by Col. Sykes, London, 1838, P.—By the same.
14. Statistics of the Metropolitan Commission in Lunacy, by Col. Sykes, P.—By the same.
15. Statistics of the free City of Frankfort on the Main, by Col. Sykes.—By the same.
16. On the Measurement of Heights by common Thermometers, by Col. Sykes, P.—By the same.
17. Report of the Metropolitan Commissioners in Lunacy to the Lord Chancellor, London, 1844.—By the same.
18. Debate at the East India House, by Col. Sykes.—By the same.
19. Remarks on the Identity of Personal Ornaments, sculptured on some figures in the Bhudda Cave Temples at Carli, by Col. Sykes.—By the same.
20. Notice respecting some Fossils collected in Cutch by W. Smee.—By W. H. Sykes, P.—By the same.
21. Explanatory Notes respecting six new Varieties of Vine, by W. H. Sykes, P.—By the same.
22. London, Edinburgh and Dublin Philosophical Magazine, Nos. 174, May 1845, 175, June 1845, with supplement, No. 170.—By the Editor.
23. Mémoires de la Société de Physique et d'Histoire Naturelle de Genève, Tome X. 2e partié, 1844.
24. List of the Geological Society of London, 1845.
25. Memoires de la Société Royale des Antiquaires du Nord, 1840 to 1843.
26. Antiquarisk Tidsskrift udgivet af det Kongelige Nordiske oldskrift selskab, 1843.
27. Die Königliche Gesellschaft für Nordische Alterthumskunde, 1843.
28. Société Royale Des Antiquaires du Nord le premier Jauvier, 1845, 10 pamphlets.
29. A Danish Newspaper.
30. United States's exploring expedition during the years 1838, 1839, 1840, 1841, and 1842, by Charles Wilkes, 5 volumes, with atlas.—By C. Hufnagle, Esq.

EXCHANGED.

31. Calcutta Journal of Natural History, No. 23, for October, 1845.
32. Athenæum, for 9th, 16th, 23rd and 31st August, 1845.
33. Asiatic Journal, May, 1845.
34. Journal Asiatique, quatrième Série, Tome V. No. 22, Février, March, 1845.

PURCHASED.

35. Annals and Magazine of Natural History, No. 103, for August, 1845.

36. North British Review, No. 6, for August, 1845.
37. Journal des Savants, for April and June, 1845.
38. General Synopsis of Birds, by J. Latham, London, 1781 to 1790, 10 volumes.
39. Correspondence relating to Persia and Affghanistan, 1841.
40. Correspondence relating to Persia, 1841.
41. Histoire Naturelle des Poissons de l'Eau Douce, par L. Agassiz, Tom., I. Neuchâtel, 1842.
42. Ditto ditto plates, 2e Livraison.
43. Researches into the Physical History of Mankind, by J. C. Prichard, vol. 4th.

The proceedings for the month of October were read and confirmed.

Read the following letter from the University of Christiania.

To the Vice-President and Secretary of the Asiatic Society of Bengal, Calcutta.

SIR,—Having been charged by the University Council to acknowledge the reception of your favor dated 8th October, 1844, in which you inform our University of the valuable and interesting objects which the Asiatic Society at Calcutta have been kind enough to send, I avail myself of the opportunity of sending your learned institution a parcel, containing different sorts of seeds, which I hope may be of interest to your botanical garden. The Council have also ordered me previously to inform you, that a collection of several scientific objects for the Asiatic Society very soon will be sent off from here, and that a letter from the Council, which is to accompany the same, will contain a list thereof.

The Council will feel itself very much obliged to you, Sir, if you would be so kind as to buy for the account of our University Library, some books and manuscripts, the list of which follows enclosed.

C. W. HOLST.

Christiania, 16th June, 1845.

The Secretary stated that he had thought it advisable to despatch the packet of seeds at once to Dr. Wallich, from whom he had a letter expressing his best thanks to the Society, and stating that several of the seeds had already germinated.

Read also the following letter accompanying a packet of diplomata :—

SIR,—On the part of the Royal Norwegian Society of Science at Drontheim, I have the honor of forwarding four diplomata for Messrs. Blyth, Griffith, Bird and Torrens, directors of the learned Asiatic Institution at Calcutta,—as members of the mentioned Society. The attention these gentlemen have shown our university, and the kindness with which they, as directors of the most learned East Indian Institution, have entered into our views of forming a more intimate scientific connexion, have induced the council of the Royal Norwegian Society to offer those diplomata as a token of its most sincere respect and obligation. In wishing that the amicable connexion which already exists between our Scientific Institutions may always grow stronger and more interesting on both sides.

I have the honor to be, Sir,

Most sincerely your obedient and obliged servant,

CHR. HOLST.

Christiania, the 6th June, 1845.

The Secretary was requested to transmit those for Mr. Bird and Dr. Griffiths, the latter to his widow; and on the suggestion of the Sub-Secretary it was moved and agreed to unanimously, that the Society should take this opportunity of addressing a letter of condolence to Mrs. Griffiths: The following has been accordingly sent with the diploma:—

MRS. W. GRIFFITHS.

MADAM,—In transmitting to you the accompanying diploma I am directed by the Asiatic Society of Bengal to express its deep and heart-felt condolence with you for the irreparable loss which you have sustained.

The Asiatic Society had not been inattentive to the great scientific ability, untiring zeal, and thorough disinterestedness of the late Doctor Griffiths; and it looked forward to the day when, had it been so permitted, he might have been associated, and that in a position worthy of him, to the labours of its members; in aid of which he had already contributed so valuably and ably.

This hope no longer exists: but the Asiatic Society have deemed it right to express how deeply it mourns, in common with the scientific public of India and Europe, the loss of one from whose labours so much had already resulted and so much more was hoped for.

(Signed) H. TONRENS,

Museum, the 7th Nov. 1845.

V. P. and Secretary Asiatic Society of Bengal.

Captain Marshall's notice of motion at the last Meeting which was as follows:—

Resolved, that it is the opinion of the meeting, that a meeting of the Society should invariably be held once a month for the purpose, if of nothing else, of affording the members an opportunity of meeting together: and that the day of meeting should if possible be the first Wednesday of the month, as they consider it a matter of convenience and importance to have some fixed day of meeting, and at the same time to adhere to the original rules of the Society.

and had been circulated to town members with the following note:—

CIRCULAR.

To

SIR,—The accompanying notice of a motion by Captain Marshall for the ensuing meeting of the Asiatic Society, is circulated for your information, with a request that you will benefit the Society by attending to assist at its discussion.

H. TONRENS,

Asiatic Society's Rooms, the 22nd Oct. 1845.

Vice-President and Secretary.

was now brought forward and read by the Secretary.

In the absence of Captain Marshall the resolution as above was proposed by the Chairman, seconded by the Secretary, and carried.

Read an application from the Zoological Curator, respecting certain books which he desired to have purchased.

The purchase was sanctioned, under a reservation as to some of the books not priced, which was to be left to the Secretary.

Read the following application from T. C. Jerdon, Esq. of the Madras Medical Service :—

TO H. TORRENS, Esq. &c. &c. &c.

SIR,—May I request that you will lay before the Asiatic Society of Calcutta my request to be permitted the loan of new, rare, or interesting birds and other specimens from their museum, for the purpose of being figured in a continuation of my present publication “*Illustrations of Indian Ornithology*,” which I intend commencing immediately, and which is to be entirely got up by Messrs. Reeve and Co. Natural History Lithographers, London, Mr. Walter Elliot, M. C. S. and myself have also in a state of forwardness a work to be entitled ‘*Illustrations of Indian Zoology*’ to be more especially devoted to mammalia, reptiles and fish, and the occasional loan of a specimen in any of these departments would be highly valued.

I need not say that the source of such drawings would be always gratefully acknowledged, and I am confident that both of the works now in contemplation will be considered more valuable from the aid of your museum, which I hope you will use your own influence to obtain.

May I further request that you will be good enough to propose me as a member of the Asiatic Society of Bengal.

Madras, 30th September, 1845.

T. C. JERDON.

Resolved that the Secretary be authorised under proper restrictions to comply with this request.

The Sub-Secretary presented a translation, with a lithograph prepared for the Journal, of an extract from the “*Estado de las Yslas Filipinas por Don Sinibaldo de Mas*, Madrid, 1843,” relative to the alphabets of the Phillippine Islanders.

The Sub-Secretary also exhibited to the meeting a MS. plane chart of the courses and distances made by the brig *Charles Heddle*, while scudding in the hurricane of the 22nd and 27th February, 1845, to the north-east of Mauritius, and developing a series of spirals by the conjoined action of the hurricane and its storm wave. He announced that the memoir to this curious chart was in forwardness for publication.

REPORT OF THE CURATOR MUSEUM OF ECONOMIC GEOLOGY AND GEOLOGICAL AND MINERALOGICAL DEPARTMENT.

GEOLOGICAL AND MINERALOGICAL.

Our active member and contributor Lieut. Sherwill, B. N. I. has forwarded to us seven boxes containing a fine series of specimens illustrative of the Geology of Behar, of which

his map and note will, as he advises, follow as soon as completed, a portion of the hilly country to the west of Rhotasghur still remaining unsurveyed, Lieut. Sherwill has also sent us specimens of the curious sandstones, of which his descriptions and figures will appear in the 163rd No. of the Journal.

Mr. Rechendorf, a German gentleman educated as a Mining Engineer, has obliged us with a paper on the Geology of upper India, which he has had some extensive, though brief opportunities of examining, having travelled up from Bombay to Ferozepore, and then by the hills before visiting Calcutta: this paper is now in the hands of Dr. Roer, who has kindly undertaken its translation.

Capt. Abbott, B. A. has also obliged us with a paper on certain specimens of splintered agates found in clay strata bordering on the Nurbudda, the origin of which is probably to be sought for in the fissures of the rocks, occasioned by movements of upheaval or subsidence; unless indeed we admit of any glacier agency so near the equator, or that the agates might possibly be fractured by the agency of torrents and the grinding of boulders in them, or at cascades, and subsequently carried by inundations with other debris to form part of the till deposited on the banks of the river.

By Mr. Rechendorf, I have forwarded to professor Ehrenberg at Berlin, twenty-four bottles of our river water, being twelve bottles taken (one in each month of the year) in the middle of the river at Calcutta, and at Burisal, so as to enable him to compare the infusoriæ of the sediments of the great tropical rivers with those of European ones.

Major General Cullen, resident at Cochin, forwards us from Cochin a small box by dawk, and since two chests by sea, of a limestone deposit from the Breakwater at Cochin. I have not yet had time to examine the specimens. The General's letter is as follows:—

H. PIDDINGTON, Esq.

MY DEAR SIR,—I do not know if, in my last note to you, I made any mention of a discovery I had recently made in this vicinity of a calcareous deposit, I believe the first instance of the kind that has yet been noticed on any part of the coast of Malabar though frequently searched for. Indeed, the absence of all calcareous deposit below or along the top of the ghat has become almost proverbial.

I have met with traces of a calcareous infiltration—in the seams of a kind of greenstone rock near Trevandrum, but that is the only other instance I have heard of,—towards Cape Comorinkunker appears, and you know perhaps that that deposit abounds on the east side of the ghat at Tinevelly. Captain Newbold I believe found nummulite nodules somewhere between Mangalore and Sedashigheer, but not I believe, *in situ*, probably Pattimar ballast. My notice was first drawn to the present deposit by the excavations made for canal work. Some small flat pieces of stone were brought to me, some of them of rather singular form. I immediately perceived they were calcareous. I ordered the search to be continued, and a little deeper they came to large thick slabs of a coarse, dark, greenish limestone, at first supposed to be a disintegrating greenstone or hornblende slate. It, I however immediately ascertained to be limestone also. Instead of blue stiff mud or clay, the more general stratum, the soil here was a dark greenish sand, in fact the detritus of the slabs, a calcareous sand, a most singular and interesting appearance. I fancied that the slabs had the usual direction, N. W. and S. E. and I ordered corresponding search.* I recollected

* At first the existence of limestone here appeared to me so very problematical, that I could hardly believe it. *in situ*, I suspected that the slabs must have been remains of some

some mud (indurated) deposit on a sandy shallow off the coast, eight or ten miles north of Cochin. I set people there also and I have been most successful—I have found no more of the slabs, because if any they have not gone deep enough, i. e. to five or six feet, but I have found them to abound in the upper stratum of loose detached pieces and nodules, at a depth of one and half or two feet in the mud or clay on the shores of the Breakwater. All these have the strongest resemblance in form to fossil bones.

I have packed up in a box a small collection of all the varieties I have yet found, and dispatched it lately to Madras to go by an early steamer to Calcutta. The enclosed sketch of the appearance of these bone-like fossils? is by a medical friend who examined them when passing Trevandrum. I have more recently collected a great number more—and will forward them to you if desired.

I will also now forward to you by post a few small specimens, with a little sketch of the tract where they are found, together with a rough drawing or etching of some of the slabs and more remarkable nodules.

The more compact limestones, as I have already noticed, are found on the shores of the Breakwater. On the sea beach are found abraded corals, and small flat pieces of stone, some very much like the laminae of the large massive slabs of the canal, others a conglomerate of minute shells, gravel, sand, and the small grains or particles of the coarse limestone. Indeed the particles of the coarse limestone seem to form the cement.

The sea beach varieties are found at upwards of forty miles north of Cochin, but they do not appear to extend above three or four miles in a southerly direction, all of which seems to strengthen the supposition that the deposit is limited, forming a bed or stratum conformable to the general direction of the primary rocks of this coast.

One of the first objects of my seeking or discovering this limestone was to try its properties as a cement, and it seems to possess all the essential of the most perfect *water cement*. Properly prepared and formed into a small ball without sand or any thing but water, if thrown into water it hardens in a few minutes, in the air it hardens almost instantaneously. It answers perfectly to Col. Pasley's description of the best water cement. We have no experience here however, and I shall therefore send some for experiment to Madras, to Capt. Smith of the Madras Engineers.

This is a hasty and imperfect account, I will endeavour to send you a more correct one hereafter.

W. CULLEN.

Cochin, July, 1845.

Sketch.

1. like the Scapula or shoulder blade.
1. like the Femur or thigh bone.
1. like Os Innominata, or one side of the Pelvis.
2. short ends like the Tibia and Fibula of hind legs.
2. ditto like the knee bones of the fore legs.
1. short piece like the great Trochanter or end of the thigh bone forming the hip joint.
1. large piece (hollow) apparently petrified wood.

building, a discovery perhaps equally interesting, but I have never heard of that stone used in building in Malabar. I was delighted therefore on finding traces of it in the prolongation of the line.

H. PIDDINGTON, Esq. *Calcutta.*

MY DEAR SIR,—I fear you will think me troubling you more about these Cochin limestone deposit than they deserve. I am now sending you by the Brig Fortitude two more boxes of specimens. I shall now have furnished you with sufficient samples, and will not trouble you again.

I have sent you some very small specimens by post, and a small box will reach you via Madras probably by the next steamer.

I shall feel greatly obliged by any remarks on them you may be so good as to favor me with.

W. CULLEN.

Cochin, 7th August, 1845.

We have several notices of earthquakes, and I had indeed proposed, but was prevented by illness, to collect all those which appeared in the newspapers for publication.

The following are however of so much interest that they should not be passed over.

Extract from a letter from Lieut. Blaggrave, dated Kurrachee, 16th October.

“Native letters have been received from Sinkpul, the frontier town of Kutch Booj, stating, that two shocks of an Earthquake were felt there on the 19th of June, and that on the 25th fifteen distinct shocks were felt; no mention is made of any loss having been sustained. Rain had not fallen up to the 27 ultimo; this is an extract from the Kurrachee Gazette. I have since heard that an immense body of water has been forced for many miles in all directions over the Runn, and that the old tower of Sindrec Fort has been nearly destroyed by it. I shall try and get leave to visit it, and will if I go send you any thing that I may find there.”

The next notice is from our active member Capt. Hannay, Upper Assam.

H. PIDDINGTON, Esq.

MY DEAR SIR,—You will no doubt have several notices of the late earthquake in the Assam valley, and I have now the pleasure to send you my notes on it.

“Debrooghur, 26th July, at 8 minutes past 2 P. M. rather a severe shock of an earthquake the motion a trembling, with distinct jerks towards the end of the shock, which lasted about a minute.

“This shock was accompanied by a loud rumbling noise which was heard, and the advance of the rocking motion almost perceptible at one end of the Bungalow before it was felt throughout the house, so that the approach of the shock was (apparently) gradual, and it was neither violent nor sudden. The direction appeared to be from west to east but more likely S. W. to N. E. the direction of the valley.”

For some days previous there had been heavy rain—on the evening of the 25th about 8 P. M. a brilliant meteor passed from south to north on the Heavens, and burst behind a cloud. The sky that evening had a singular appearance; although cloudy, the moon seemed to stand out beyond them—unusually hot weather succeeded this earthquake, when heavy rain fell about the beginning of August, after which succeeded some days of hot and oppressive weather. On the evening of the 4th instant we had heavy clouds and lightning in the S.W. which cleared off. On the evening of the 5th there was the same appearance, the clouds being heavier with lightning all round the horizon; and early on the morning of the 6th we had a heavy storm of wind from south and S. W., the sky during this day was cloudy and the air comparatively cool. Between 11 and 12 P. M. we had a slight shock of an earthquake, and towards the morning of the 7th a heavy S. Wester with

rain; about 4 p. m. on the 9th another heavy storm of thunder and lightning and rain, and with an interval of two days of oppressive heat, another fearful storm of thunder and lightning at 2 p. m. on the morning of the 12th inst.

The season in Upper Assam has been excessively hot. Heavy storms of thunder and lightning with heavy rain, succeeded by the hottest sun that has been felt for many years; sickness however is not more prevalent than usual amongst the natives of the country.

N. B. The Earthquake of the 26th was felt on the Burmapootur, at Gowhatee, Sibsagor and Jeypoor within a few minutes apparently of 2 p. m. At Gowhatee it was an unusually severe shock, that of the 5th or 6th appears to have been also felt there.

II. HANNAY.

Jeypoor, the 22d August, 1845.

Lieut. Blagrove has also sent us a drawing, and promises specimens, of some fossils from Kurraheec.

To Major Wroughton, Acting Surveyor General, we are indebted for a highly curious fossil, both in itself and as to its locality; being he thinks a *Madrepore*, but I am disposed to think it possibly (though no articulations are visible) part of an *encrinite* of large size? which is from between the Neetee pass and Gortope, at 15,000 feet above the sea! and it is moreover evidently part of a boulder; I think this is the first record of any fossil of either of the families alluded to above (*Zoophyta* or *Echindermata*) being found in the Himalaya!

MUSEUM OF ECONOMIC GEOLOGY.

Mr. Reehendorf, to whose obliging contribution in general Geology I have alluded above, has also favoured us here with a paper (printed in number 163) of singular interest on the Copper mines of Pokree and Dhanpoor, in Kemaon, which is of much importance, as fully corroborating the views which have been held by other practical men, and especially by Mr. Wilkin, who indeed complained to me that the means of expenditure placed at his disposal were so small that it was impossible to make any fair experiment.

To Welby Jackson, Esq. B. C. S. we are indebted for a highly interesting paper on the iron ores of Bheerboom, with a good set of specimens illustrative of it.

From Kyook Phyoo our attentive friend, Major Williams, sends us from Capt. Clarke a specimen of an argillaceous shale, perhaps from the Mud Volcanoes, which is discoloured on one side, apparently by the action of heat; and also a small ingot-shaped piece of metal, which on examination proved to be pure zinc with a minute trace of iron. The native who brought it to Captain Clarke says "there is plenty of it," but as zinc has never yet been found in the metallic state we must suspend our judgment of the matter till we have further notice of the locality, which I have written for.

Captain Jenkins forwards us from Assam a paper with specimens by Captain Hannay, to whom I had when here given a specimen of the true *Asphalte*, requesting his attention to the various deposits known to exist in upper Assam, with the hope of finding there a true *Asphalte* or some substitute for it.

Captain Hannay's paper and specimens are of the very highest interest, and as soon as I have examined the latter I shall further report on it.

Mr. Martin, Executive Officer in Assam, has sent us a farther supply of 20 specimens of woods from that country, of which the list is as follows:—

List of Woods, &c. being a Continuation from Assam.

XXV.—Bhoza.	XXXVI.—Kahtoleah Bolah.
XXVI.—Azar.	XXXVII.—Boon Bogrec.
XXVII.—Ooiceam.	XXXVIII.—White Holong.
XXVIII.—Kutal.	XXXIX.—Cedar.
XXIX.—Poma.	XL.—Oohriam.
XXX.—Gomaree.	XLI.—Bon Choong.
XXXI.—Pasulee.	XLII.—Dhop.
XXXII.—Sileka.	XLIII.—Red Holong.
XXXIII.—Owhee.	XLIV.—Long Cheng.
XXXIV.—Poddo Cedar.	XLV.—Sonaloo.
XXXV.—Bhoj.	

He has also sent in the box some pretty specimens of Magnetic Iron sand in layers, interleaved in fact, with sandstone, from the Luckee Dowar lower range of the Garrow Hills.

Mr. Watkin, who superintends the Raneeunge Coal mines, having visited the Museum about a year ago, and being kind enough to offer his services, I gave him some tin boxes arranged for receiving specimens of the vegetable impressions of their coal shales. The boxes, which it appears have remained in Calcutta for some six months, have now reached us with a good assortment of the impressed shales which are of great interest.

Our Secretary has sent us a lump of clay impregnated with quicksilver, found on digging away some ruins near the old Mint, no doubt the produce of some broken package in the olden time.

From Mr. Higgins, an officer of the steamer Fire Queen, we have received by Mr. Blyth, a lump of black concretion which was taken from one of the flues of the steamer boilers at a spot where it was leaky. It proves to be nothing but a mixture of salt from the evaporation of the water oozing through the leak, and the carbonaceous matter of the smoke, but it is so far curious that it shows, like the sparks at the top of the funnel, the very imperfect combustion of the fuel, which is here in coarse grains, and, it may be, would account for some cases of explosion.

II. PIDDINGTON.

For all the foregoing communications and presentations the best thanks of the Society were accorded.

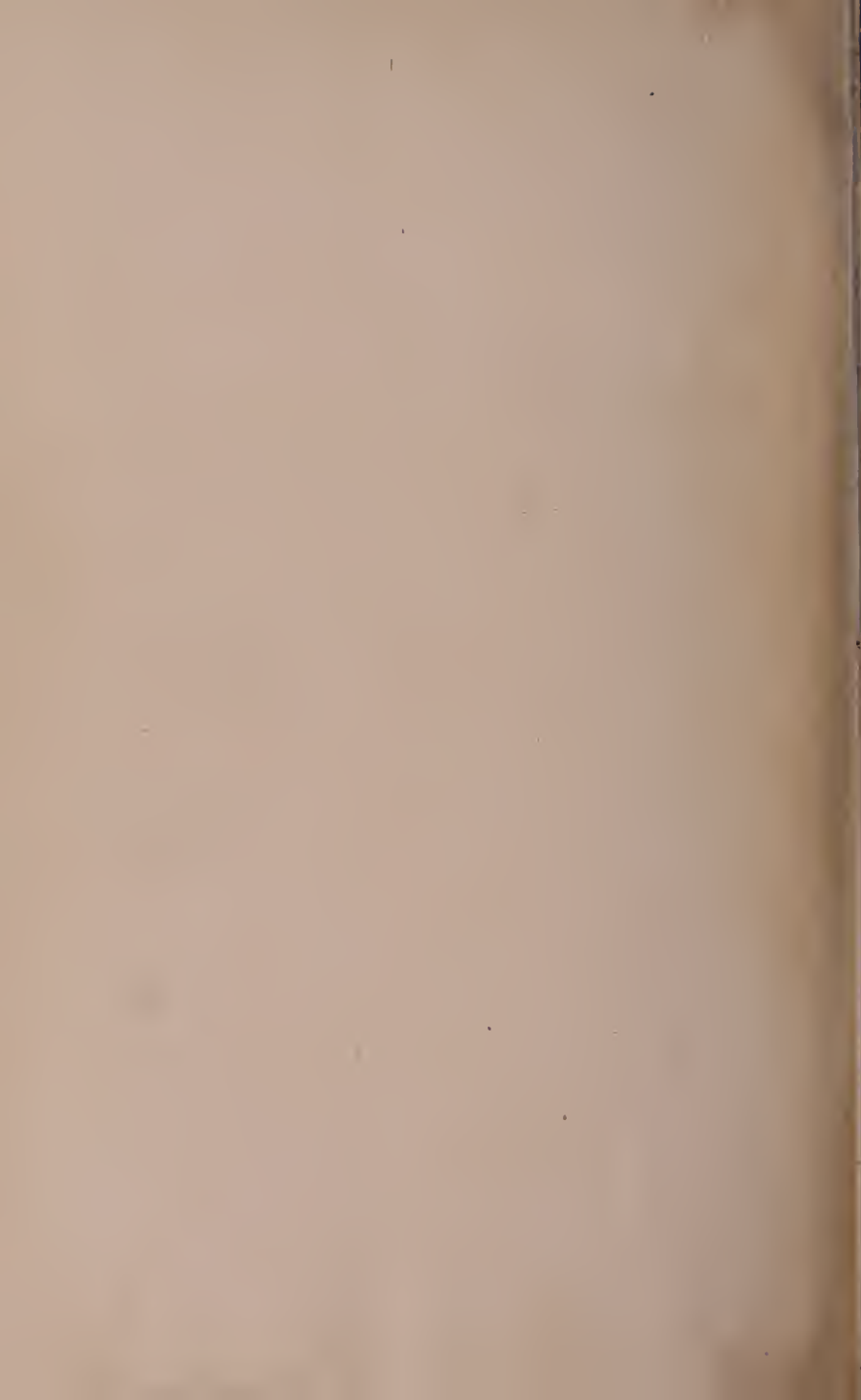
श्रीश्रोदुर्गा ॥

एसियाटिक् सोसाइट् संस्कृत नागराक्षर ॥

महाभारतं आद्यन्त ४ खण्ड	...	...	४०
महाभारतीयार्त्तगतसूचीपत्र आद्यन्त			
४ खण्ड	...	...	६
नैषध आद्यन्त सटीक् १ खण्ड	...	...	६
हरिवंश आद्यन्त १ खण्ड	...	...	५
राजतरङ्गिणी आद्यन्त १ खण्ड	...	...	५
सुश्रुत आद्यन्त २ खण्ड	...	...	८
सूची पुस्तकं १ खण्ड	...	...	१
लासनेन रचितं सर्व साधारण	...	...	४
गीतगोविन्द १ खण्ड	...	...	२॥
यज्ञदत्तवधः १ खण्ड	...	...	२२॥
शकुन्तला नाटक्	...	...	१०

فهرست کتابهای عربی و فارسی مطبوع که در خانه اشیا تک
سوسیته حسب تفصیل الذیل بقیتمهای مناسب برای فروخت
موجود اند

اسامی کتب	قیمت
فتاوی عالمگیری مرتب بشش جلد فی جلد	هشت روپیه
عنایه جلد ثانی وثالث و رابع فی جلد	هشت روپیه ...
شرائع الاسلام	... .. هشت روپیه
انیس المشرحین	... .. پنج روپیه
جوامع علم ریاضی	... .. چهار روپیه
اصطلاحات صوفیه	... .. پنج روپیه
خزانة العلم	... .. هشت روپیه
تاریخ نادری	... .. هشت روپیه
فهرست کتب کالج فورث ولیم واشیا تک سوسیته	یک روپیه



For use in Library only

